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MILTON WHITNEY, Chief.

A STUDY OF CROP YIELDS AND SOIL COMPOSITION IN RELATION TO SOIL PRODUCTIVITY.

BY

MILTON WHITNEY.

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BUREAU OF SOILS.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Soils,
Washington, D. C., February 8, 1909.

Sir: I have the honor to transmit herewith a manuscript of an article entitled "A Study of Crop Yields and Soil Composition in Relation to Soil Productivity," and to recommend that this be published as Bulletin No. 57 of the Bureau of Soils.

Respectfully,

Milton Whitney,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

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A STUDY OF CROP YIELDS AND SOIL COMPOSITION IN RELATION TO SOIL PRODUCTIVITY.

INTRODUCTION.

The maintenance of the productive capacity of soils has been a subject of study and concern from the earliest historic times. The old Roman writers clearly recognized that soils may quickly become worn out by certain methods of cultivation and cropping, and that different types of soils show marked differences in their crop adaptations and endurance under different methods of culture.

The works of Cato, Varro, Virgil, Columella, Pliny, and Palladius, as well as many of the still earlier Greek writers, show that the proper system of cultivation, manuring, and cropping under intensive methods to maintain the productivity of the soil was uppermost in men's minds at that time. It was clearly apparent to them that system and intelligence, and these alone, were needed to reduce the number of individual failures to maintain the soils generally in a more productive state.

According to Dickson,[a] the Romans had a greater variety of crops and exercised considerably more care in adapting them to the different soils than did the English at the time he wrote (1788), and more than we seem to give in this country. Considering Pliny as more particular in his directions as to the adaptation of crops to soil, Dickson gives Pliny's maxims in detail as follows:

> Such a difference of soil, he says, points out the necessity of describing the kinds proper for the different crops. This is Cato's opinion, that corn should be sowen on land that is stiff, rich, and in good heart; that radish, millet, and panic, should be sowen upon the same kind of land, if moist or wet; that seed should be first sowen in cold and wet soils, and afterwards in warm; that lupines should be sowen in the red soil, the soil called *pulla*, or sandy soil, if they are not wet; *far* in moister fields, where the soil is chalky and red; *triticum* [wheat] in dry land, not liable to weeds, nor in a shade; beans in strong soils; *siligo* and *triticum* in open and exposed fields that receive greatest benefit from the heat of the sun; lentils in uncultivated and red soil, where there is not much grass; barley on fallow, and land so rich as to carry a crop every year. Spring sowing should be used in places that can not conveniently be sowen in autumn, and in soil whose fatness can carry constant crops. This maxim too is exact. These things should be sowen in shallow soil that do not require much sap, as the *cytisus* and *cicer;* legums are excepted, which are pulled

[a] The Husbandry of the Ancients, Adam Dickson, Edinburgh, 1788, Vol. 1, p. 187.

up and not cut in reaping; hence they are called *legums*, because thus gathered. In fat soil, should be sown such things as require much food, as garden herbs, *triticum*, siligo, flax. So, for the same reason, the shallow soil is allotted for barley, because it does not require much food, the richer and stiffer for *triticum*. In low lying grounds, *far* rather than *triticum* should be sowen. In grounds neither very high nor low, both *triticum* and barley; hilly ground produces plumper *triticum*, but not so large a crop. *Far* and *siligo* may be appointed to chalky and wet soils.

Theophrastus does not enter into particulars, as the Roman authors do; but he declares, in general, that, to know how to adapt plants to soils is one of the principal things in agriculture.

Regarding the management of soils, Dickson further says:[a]

By schemes of management, we mean the crops that are cultivated, the culture given them, and the order in which they succeed each other. In Britain we have a variety of schemes of management; we have successions of different crops, and we have the same crops succeeding each other, in different orders. It was so likewise among the Romans; and their different schemes were adapted to their different soils.

When the soil was very good * * * they raised several different sorts of crops in succession. Pliny mentions two schemes in this rich soil: That kind of soil, says he, called tenera may be croped in this manner; barley, millet, raddish, and then barley again, or *triticum*, as in Campania. For one of these crops, the land was always dunged, probably the millet; for Pliny mentions this among the crops to which dung was always applied. In this succession of crops there was no fallow intervening, and Pliny observes, that it was sufficient to plow the land immediately before, or when it was sowen. * * * Another order of croping, says Pliny, after a crop of *far*, let the land rest during the four winter months, and then be sowen with the spring bean, that so it may not rest till next winter, but carry a crop every year. * * * Columella says, that, when beans are sowen upon land that has carried a crop the year immediately preceding, dung must be applied. And Pliny himself says * * * that, even when beans are sown upon land that has not carried a crop, it must have been lately dunged.

Land that was treated in this manner, and carried a crop every year, was not very common; it was found chiefly in Campania, the country which was reckoned the most fertile in Italy. Pliny mentions a very extraordinary field in it, which, as it carried a crop every year, and more valuable crops too than those that have been mentioned, falls naturally to be taken notice of in this place * * *.

Ploughing, as was observed in the last chapter, is the most important operation in agriculture: but it cannot be performed in all its perfection, nor all its advantages obtained, except when land is summer fallowed. Of this the ancients seem to have been very sensible; for, instead of recommending fallowing, as is commonly done by writers on husbandry in modern times, the ancient writers mention it as a necessary preparation for a crop in ordinary soils. In Switzerland, Geneva, and some provinces of France they have a crop and fallow alternately. This seems likewise to have been the common practice among the Romans, from whom these nations no doubt received it. This practice probably arose from the opinion that the earth was in some measure exhausted by carrying a crop, and needed a year's rest to enable it to produce another * * *.

This extract gives a very fair view of the opinions held some two thousand years ago regarding this important matter of soil fertility and of the systems devised to maintain the productivity of soils. It was clearly recognized then, as it still is by many, that the mainte-

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[a] Ibid., pp. 228, 449.

nance of productivity is a personal matter with the tiller of the soil and depends upon his knowledge, skill, and industry. The present condition of the agriculture of Italy would seem to bear out this view and give no reason to fear a permanent loss of productivity with efficient methods of soil management, at least in finite time.

Little progress was made in our knowledge of the soil and its relation to crops or of methods of management until the modern science of agricultural chemistry was established by Liebig about 1840. The mineral theory of plant nutrition supposed that productivity depended upon the amount of available mineral plant-food elements present in the soil. Recently the Bureau of Soils has been able to show that the chemistry of the organic matter of the soil is probably of as much importance in the productivity of land as is the chemistry of the mineral matter. The effects of plowing, fallowing, draining, rotation of crops, and manuring are associated in one way or another with changes in the organic matter of the soil necessary to maintain productivity. In these days, of course, everyone recognizes the importance of cultural operations on physical and biological characteristics of the soil. Such natural agencies as climate, distribution of rainfall, sunshine, etc., are coming to be recognized as at least fully as important as the inherent characteristics of the soil.

The facts established by Liebig concerning the mineral necessities of plant development have been taken too literally and too narrowly as applied to the soil, and permanent losses have been feared which would in time completely exhaust the soil of mineral elements and leave it a barren waste. The impression is very strong in this country to-day that our soils are wearing out at an alarming rate, that yields are falling off, and that, without the liberal and universal use of phosphates, potash salts, and nitrates, to replace the amounts removed by crops, the soils will become permanently sterile.

On the supposition that the soil otherwise remains constant in composition, save only as material may be artificially added to it in fertilizers or subtracted from it by crops sold off the farm, various calculations show that the end of soil productivity under existing methods of culture will come at from seventy-five to one hundred and fifty years.

The fact that the soils of Europe and of Asia have been under agricultural occupation for many centuries, supporting a much denser population than our own, would seem to show such ideas to be erroneous when applied to our own soils, the bulk of which have been occupied for not more than fifty or seventy-five years.

As the researches of the Bureau of Soils have been published in a number of different forms—bulletins, and papers in scientific journals—it will be unnecessary at this place to give a résumé of the functions of the soil and its relation to crop production to explain

the apparently anomalous fact that we can extract plant food elements from the soil in our growing crops and yet leave the soil with apparently unimpaired supplies for future crops. Two points, however, will be mentioned to show the futility of the bookkeeping system of estimating the future resources of the soil.

The researches of the several experiment stations throughout the world and the investigations of our engineers on the amount of material carried in solution and in suspension in our principal rivers and borne by the wind, establishes the fact that loss through natural leaching and erosion removes far more mineral plant food elements than do cultivated crops. In cropping soils, therefore, and removing the crop from the land, we remove an inconsiderable amount of mineral material compared with normal losses to which the soil is adjusted through natural laws.

The second point opposed to this bookkeeping system of accounting for the plant-food constituents is that in a small majority of analyses reported in this country and abroad where both soils and subsoils have been examined, the upper soil, from which presumably the roots of annual plants take most of their mineral matter, has a content of potash and phosphoric acid higher than the subsoil.

From the meager information to be found in the works of the early agricultural writers of Greece and Italy it seems probable that the yields per acre obtained at the present time are not much different from those obtained in the earlier historic times. There are not many records in the literature of yields per acre for any field, farm, or country going back for any considerable number of years. Official estimates of yields have been kept by the United States Government and many of the States for the past forty years. Similar statistical estimates have been kept by most of the European countries for the past twenty or thirty years. Beyond this the information is fragmentary and possibly less trustworthy.

In the consideration of data of this kind it would at first sight seem more valuable to have continuous records of successive yields of a single field. However, the yield of a State is probably more reliable in showing changes in productivity because it combines a great number of individual fields and averages the results of all the individual methods used in the community. The first method would have the advantage of actual weight or measure of crop produced on a measured area; this is more certain, but it would depend upon the knowledge and skill of individuals and would vary greatly with the individual and with the soil type. The second method, depending as it does merely on estimates, has a less reliable basis, but largely eliminates differences in individual effort and differences in soil, provided the acreage remains fairly constant. Assuming reliability of the estimates, the second method would undoubtedly give more reli-

able information concerning the relative productivity of a State. Material changes in acreage or a considerable change of the area of production within the State would of course have an influence which must be considered in comparing and valuing results, even if no figures can be given for an exact expression of such change in the area cultivated.

When the yield per acre for a State or country under practically constant acreage is shown to have increased during a long period of years we may assume that the *productivity* has not declined. Much of this increase may result from improved methods of agriculture, better selection of seeds and crops, or the introduction of more live stock; and, for the purpose of our present inquiry, we need go no further to explain the increase or maintenance of productivity.

There are two matters, however, which should be considered in this connection. The first is the question of commercial fertilizers. If the productivity of the soil of a State depends ultimately and literally upon our returning an equivalent amount of plant-food constituents to the soil to replace that removed by the crop, then the life of the nation will ultimately depend upon the available deposits of nitrates, phosphates, and potash compounds. It is clearly impossible with the available data to give any expression of the amount of such replacement which has been made in the past, but from what we know, so far as the actual importation of mineral material foreign to the farm is concerned, it is negligible.

The use of commercial fertilizers is not old. The potash deposits of Germany were first worked in 1862, the phosphate deposits of South Carolina in 1868. Phosphates were discovered in Florida in 1888 and in Tennessee in 1894. It may be said that the general use of commercial fertilizers began in the United States about the year 1865.

The other matter which should receive attention is the influence of material in the form of foodstuffs imported from less densely settled countries to those of greater population as a possible source of introducing foreign mineral matter to maintain the productivity of the soil of the older and more densely settled countries. If any such transference of mineral material actually takes place to an extent sufficient to maintain or increase the productivity of more densely populated countries, then it is but reasonable to expect that the productivity of the soil of the more recently settled and more sparsely settled countries from which foodstuffs are exported would show a falling off in productivity. From this point of view the soils of the United States might be expected to show some material decline in productivity as a result of the enormous amount of foodstuffs exported, while the soils of Europe, to which these foodstuffs mainly go, should show a corresponding increase. But here again the impor-

tant thing to determine is whether the productivity of the soils of the newer country is actually declining.

In comparing figures representing yields per acre over a series of years, whether for an individual farm or a State or nation, the one variable factor, the effects of which are difficult to eliminate, is the climate. So great is the influence of climate on the yield of crops that in a period of ten years the difference between the lowest and highest yield is as great or greater than the average. Thus in the decade from 1867 to 1876 the highest yield of corn as reported for Nebraska is 42.2 bushels per acre in 1869, and the lowest yield is 10 bushels in 1874. The difference, 32.2 bushels, is almost the same as the average for the decade, 32.5 bushels. Again in the decade from 1887 to 1896 the highest yield was 37.5 bushels in 1896, and the lowest 6 bushels in 1894. The difference, 31.5 bushels, is greater than the average for the decade, which is given as 26.2 bushels. There was no crop failure reported in the decade 1877 to 1886, in which the lowest yield is 27.4 bushels. In the decade 1897 to 1906 the lowest yield is 14.1 bushels. In the decade 1867 to 1876 occurred the highest and next to the lowest yield for the State in forty years.

The figures representing the yield of corn per acre in Nebraska for forty years, compiled from the published records of the Bureau of Statistics, arranged according to yield in each decade, is given in the following table:

Average yield of corn per acre in Nebraska by years and by decades, 1867–1906.

Year.	Bushels.	Year.	Bushels.	Year.	Bushels.	Year.	Bushels.
1874	10.0	1881	27.4	1894	6.0	1901	14.1
1868	22.9	1886	27.4	1890	18.0	1898	21.0
1870	29.9	1880	31.0	1895	16.1	1900	26.0
1876	30.0	1882	34.9	1887	24.1	1903	26.0
1873	35.0	1883	36.0	1893	25.2	1899	28.0
1867	36.0	1885	36.7	1892	28.2	1897	30.0
1872	37.8	1884	37.7	1888	35.2	1902	32.3
1875	40.0	1877	38.0	1891	35.2	1904	32.8
1871	41.5	1879	41.0	1889	36.5	1905	32.8
1869	42.2	1878	42.0	1896	37.5	1906	34.1
Decade	32.5	Decade	35.2	Decade	26.2	Decade	27.7

With variations so great as these, and, in fact, with the statistical records of any of the States, it is unwise to draw very positive conclusions from the average yield for decades, as ten years is not a sufficient period to minimize the results of extraordinary seasons.

These variations must be duly considered and carefully weighed in drawing conclusions regarding the increase or decrease of productivity shown by statistical records.

EVIDENCE PRESENTED BY THE YIELD OF CROPS IN EUROPE.

European countries have older agricultural soils than the United States, as they have been settled and have been developing their present agriculture for a thousand years or more, while many parts of our own Western and Central States have seen all of their agricultural development in the past sixty or seventy years.

If the views which have been taught for the past seventy years be correct, that continued cropping gradually exhausts the soil and tends to make it unproductive through loss of mineral plant food, we should expect to find a marked and fundamental difference between the soils of the United States and the older soils of Europe, as shown either in the yield of crops or in the chemical composition of the soils. We will first review such data as are available regarding the yield of crops and then consider the chemical data.

The following is given as the yield per acre of wheat in bushels in several European countries and in the United States for the ten years (1897–1906) in the Yearbook of the Department of Agriculture for 1907, page 620:

Average yield of wheat, of various countries, in bushels per acre.

United Kingdom	32.2
Germany	28.0
France	19.8
Austria	17.8
Hungary	17.6
United States	13.8
Russia (European)	9.2

On the face of it, it is apparent that the older soils of Europe are far from being less productive than the newer soils of the United States. This may be due to a difference in climate, to a greater original productivity of the soil, or to more intensive cultivation and a better system of agriculture than prevails in this country.

From the very meager data which are available, some of which will be given in the following paragraphs, it would appear that the yield of wheat in Germany in the middle of the sixteenth century was about equal to the average for the United States at the present time and that since that time the yields in Germany have about doubled. This should dispose of the idea that there is any material difference in climate or in original productivity of the soil, and throw us back to the personal effort of the farmer and the development of a more efficient system of agriculture.

The French minister of agriculture[a] gives the average yield per acre of the principal cereal crops in France from 1815 to 1876,

[a] Bul. Min. Agr. Comm. France. Récoltes des Céréales et des Pommes de Terre de 1815 à 1876, pp. 456–459 (1878).

which, reduced to bushels per acre and ten-year averages, is as follows:

Yield of cereals in France, 1815–1876, by decades.

[Reduced to bushels [a] per acre.]

Year.	Wheat.	Rye.	Barley.	Oats.
1815–1824	12.41	10.58	14.87	17.50
1825–1834	14.05	12.89	15.30	18.52
1835–1844	14.90	13.59	16.60	20.97
1845–1854	15.78	13.68	18.88	23.66
1855–1864	16.57	14.71	20.78	26.00
1865–1874	16.60	15.30	20.70	25.60
1875–1876	16.24	16.41	19.80	24.63

[a] Bushels of capacity. Statistics for the ten years 1897–1906 indicate that the average weight of a bushel of wheat in France is 60 pounds, of rye 56.1 pounds, of barley 49.6 pounds, and of oats 36.5 pounds. The statistics for France on pp. 15 and 19 are in bushels of weight customarily employed in the United States (wheat 60 pounds, rye and corn 56 pounds, barley 48 pounds, oats 32 pounds). The difference is greatest in oats, the average yield of which as given in this table is on a basis some 14 per cent lower than in the tables on pp. 15 and 19, covering later years. Comparisons between these tables should not be made without making allowance for this.

The yield of wheat has increased from 12.41 to 16.60 bushels; of rye, from 10.58 to 16.41; of barley, from 14.87 to 20.78; and of oats, from 17.50 to 26.00. The great increase in the yield of cereal crops for France occurred prior to 1860.

Quite recently the Bureau of Statistics of this department has published a report on the cereal production of Europe [a] for the past twenty years or so.

The following table summarizes the yield per acre in five-year periods, the full data for each country being given further on:

[a] Cereal production of Europe, by Frank R. Rutter. Bul. 68, Bureau of Statistics, 1908.

Average annual yield of grain, by countries and by five-year periods.

Country.	Wheat. 1886–1890.	Wheat. 1891–1895.	Wheat. 1896–1900.	Wheat. 1901–1905.	Rye. 1886–1890.	Rye. 1891–1895.	Rye. 1896–1900.	Rye. 1901–1905.	Barley. 1886–1890.	Barley. 1891–1895.	Barley. 1896–1900.	Barley. 1901–1905.	Oats. 1886–1890.	Oats. 1891–1895.	Oats. 1896–1900.	Oats. 1901–1905.	Corn. 1886–1890.	Corn. 1891–1895.	Corn. 1896–1900.	Corn. 1901–1905.
Austria-Hungary:	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Austria	15.9	16.1	16.3	18.5	15.8	15.7	15.9	18.6	20.1	21.3	20.8	23.7	24.3	25.1	25.5	26.7	19.5	19.9	18.9	18.5
Hungary	17.6	19.1	16.7	17.9	15.6	16.9	16.3	17.6	17.9	21.8	22.1	22.5	20.6	25.7	30.1	30.1	18.5	23.2	22.6	19.3
Winter	17.9	19.3	16.8	18.0	15.7	17.0	16.4	17.7	18.2	20.9	20.9	22.3	......	......	......	......	......	......	......	......
Spring	12.6	14.8	13.0	13.2	13.0	14.9	13.8	13.6	17.9	21.9	22.2	22.5	......	......	......	......	......	......	......	......
Belgium:																				
Winter	27.1	27.8	29.7	34.0	25.4	28.9	30.1	34.0	40.8	40.4	43.6	52.0	49.8	50.0	56.8	64.7	......	......	......	......
Spring	21.8	24.5	a 22.7						33.6	33.7	35.8	41.0								
Denmark	35.8	38.7	41.0	40.2	24.6	26.7	25.8	26.8	29.7	30.4	30.9	34.0	32.0	33.8	35.5	35.9	......	......	......	......
France	17.8	17.7	19.3	20.2	16.4	17.9	17.1	16.8	21.9	21.5	22.5	24.0	30.2	28.7	30.1	32.0	19.3	19.1	19.0	19.4
Germany	20.3	23.3	27.0	28.2	16.0	19.9	23.0	24.9	24.0	28.9	l 30.7	......								
Winter	21.4	23.5	27.3	28.1	16.1	20.0	23.2	25.1	29.0	33.8	l 37.8	......	33.2	37.7	45.0	47.1	......	......	......	......
Spring	17.8	21.3	a 23.3	28.0	12.1	15.7	16.8	17.5	23.9	28.8	31.8	34.3								
Italy	b 12.1	11.2	c 12.8	13.1	b 12.7	12.3	......	......	b 13.4	10.8	c 13.2	......	b 17.0	16.2	......	......	b 15.9	15.1	c 16.5	20.2
Netherlands	28.1	27.2	29.8	32.5	22.6	23.4	24.9	25.8	42.4	43.1	45.2	48.0								
Winter	......	d 28.0	29.8	32.4	......	d 24.7	24.9	25.9	46.4	47.5	48.0	50.7	45.9	46.1	50.8	53.9	......	......	......	......
Spring	......	d 28.3	30.0	35.3	......	d 20.8	20.3	22.8	34.7	35.7	38.1	40.8								
Norway	24.3	27.9	26.7	e 22.2	27.9	27.8	27.7	25.8	33.0	33.0	34.5	28.9	40.6	44.4	41.0	33.9	......	......	......	......
Roumania	15.3	16.2	13.1	18.3	13.8	16.1	13.4	18.7	13.3	17.0	13.7	18.5	18.0	18.5	16.0	23.0	14.4	14.6	14.6	13.3
Russia (total)	......	f 10.3	8.7	10.3	......	f 12.0	11.2	11.7												
Winter	......	f 12.9	10.6	13.9	......	f 12.1	11.3	11.8	......	f 14.4	12.4	14.2	......	f 20.8	18.9	20.0	......	f 11.8	13.5	13.7
Spring	......	f 9.2	8.0	9.0	......	f 10.2	9.4	9.5												
Russia, European	g 7.9	8.9	8.4	10.3	g 9.5	10.3	11.3	h 12.2												
Winter	g 11.1	11.2	10.6	13.9	b 9.4	10.4	11.3	11.8	g 11.0	13.7	12.3	14.2	g 15.1	17.7	18.6	20.0	......	m 13.9	13.5	13.6
Spring	g 6.8	7.9	7.5	8.8	b 4.8	8.0	8.2	8.9												
Servia	......	i 11.1	j 13.9	12.6	......	i 8.9	j 13.5	9.9												
Winter	......	i 11.4	k 15.2	h 12.8	......	i 9.8	k 14.6	h 11.2	......	i 11.1	j 16.4	13.9	......	i 12.5	j 24.9	14.7	......	i 13.8	j 22.2	13.4
Spring	......	i 8.4	k 10.8	h 7.9	......	i 6.8	k 13.1	h 8.2												
Spain	b 8.8	d 11.6	10.8	13.0	b 10.5	g 11.6	10.9	12.6	b 10.1	f 20.4	16.1	18.9	......	f 15.3	18.0	20.5	b 24.3	f 21.4	19.1	22.5
Sweden	b 23.2	23.5	26.1	25,0	b 22.4	21.5	21.9	22.2												
Winter	b 23.4	23.7	26.5	25.3	b 22.5	21.6	22.0	22.3	b 27.0	25.0	25.2	24.6	b 32.0	29.8	28.1	27.7	......	......	......	......
Spring	b 20.6	21.3	21.2	22.0	b 16.3	17.2	16.7	17.5												
United Kingdom	30.4	29.0	32.8	31.7	......	......	......	......	33.9	34.2	35.0	34.3	41.8	43.5	43.4	44.7	......	......	......	......
Great Britain	30.4	29.0	32.7	31.7	......	......	......	......	33.7	33.8	34.6	33.6	39.3	39.6	39.8	40.5	......	......	......	......
Ireland	27.9	30.7	32.0	34.6	24.1	26.2	24.8	27.1	36.4	39.7	40.2	42.2	47.6	53.3	53.0	56.7	......	......	......	......

a Average, 1896–1899. b 1890. c 1896. d Average, 1892–1895. e Average, 1902–1905 f Average, 1894–1895. Average, 1888–1890. h Average, 1901–1904. i 1893. j Average, 1897–1900. k Average, 1897 and 1900. l Average, 1896–1898. m Average, 1893–1895.

Commenting on this data, Doctor Rutter has the following to say:

AVERAGE YIELD OF GRAIN.

Wheat.—On comparing the area under wheat in northwestern Europe in 1905 with the average crop during 1901–1905, it appears that the average yield per acre exceeds 25 bushels; in southwestern Europe the average yield is only 16 bushels per acre, and in eastern Europe but 12 bushels. For Europe as a whole the average yield is slightly under 14 bushels per acre.

It appears, therefore, that the average yield per acre is highest where wheat culture is least generally practiced and where the acreage under grain shows the smallest increase. In other words, the extension of the wheat area is most marked where the average yield per acre is lowest.

This condition holds true as regards individual countries as well as the larger divisions of Europe. The United Kingdom, Belgium, the Netherlands, and Denmark are at the same time the four countries in which the wheat acreage during the last twenty years has shown the largest reduction and the four countries which show the largest yield per acre. In each of these countries the acreage under wheat has fallen at least one-fifth in amount, while in each of them over 30 bushels per acre has been harvested on an average during the last five years.

At the other end of the series stands European Russia, in which the increase in acreage during the twenty years was no less than 60 per cent, while the average yield per acre was little more than 10 bushels.

Between these two extremes the relation pointed out between yield and acreage has been by no means so constant, but the divergence is not sufficiently marked to affect the general correspondence. In Sweden, for instance, the acreage under wheat has shown a considerable increase, while the average yield per acre is high, nearly 25 bushels per acre. On the other hand, in Spain the low average yield, 13 bushels per acre, has been accompanied by a small increase in the acreage and the crop.

That the extent of wheat culture should vary inversely as the average yield per acre, or, in other words, that where the results are best the smallest areas are devoted to wheat, seems at first sight paradoxical. It must be remembered that a high average yield, such as shown in the Teutonic countries of Europe, presupposes intelligence on the part of the farmers and valuable land justifying a large outlay of labor and capital. These conditions are much more favorable to the growth of crops requiring intensive cultivation than to grain crops, which give the highest profit when grown on new land on a large scale. Low average yields, if obtained at a low cost of production, produce a greater aggregate profit than can be obtained from grain crops on the smaller tracts in northwestern Europe, where the high price of land necessitates its use in intensive culture. The foregoing table contains unweighted averages of the yearly average yields shown later in the detailed tables.

Rye.—The yield of rye is highest in Belgium, where during the five years 1901–1905 an average of 34 bushels per acre was obtained. After Belgium come Ireland, Denmark, the Netherlands, Norway, and Germany, in all of which an average yield of from 25 to 27 bushels per acre was obtained. The lowest average yield per acre during the same years was obtained in Servia, 10 bushels per acre, while in European Russia the average yield was slightly more than 10 bushels and in Spain 13 bushels per acre.

Barley.—Of barley, as of rye, the highest average yield per acre during the last five years was obtained in Belgium, in which more than 50 bushels per acre was grown on an average, while the average yield of winter barley alone was 52 bushels per acre. In the Netherlands the average yield was only slightly lower, amounting to 51 bushels per acre for winter barley and 48 bushels for barley of both kinds. Outside of these two countries barley is grown principally as a spring crop; and if that variety alone be considered, Ireland, with 42 bushels per acre, shows the highest average yield. In Germany, Denmark, and Great Britain the average yield per acre is 34 bushels. The lowest average yields per acre recorded are shown by the statistics of European Russia and Servia, according to which but 14 bushels per acre were raised during each of the five years under review.

Oats.—Belgium records an average yield of oats during the five years 1901–1905 of no less than 65 bushels per acre, while Ireland produced 57 bushels and the Netherlands 54 bushels. The smallest average yield per acre recorded is that of Servia, where only 15 bushels were obtained, and European Russia with 20 bushels.

Corn.—The variations in the average yield per acre of corn are far less marked than the variations in the grains already considered. The almost total absence of its culture from any country included in the northwestern division eliminates the very countries where intensive culture is practiced. The highest yield recorded in 1901–1905 was 22½ bushels per acre in Spain, while the lowest, between 13 and 14 bushels, was obtained in Roumania, Servia, and European Russia.

Considering the average yield of grain in five-year periods in the above table and the yearly yields from which this is made up, as given in the accompanying tables, and bearing in mind what has been said regarding the great fluctuations due to seasonal variations in climate, it may safely be said that the figures give no evidence of decreased productivity of the older soils of Europe in the past twenty-five years. From the more meager information which we have concerning production during earlier periods and the opinions of European writers who have especially investigated this subject from actual farm records, it would seem that there has been a decided tendency toward increased production; and this has resulted mainly from better methods of soil management, as the use of commercial fertilizers is modern in Europe as it is in this country.

Acreage and yields of cereals in Austria, 1884–1906, by years.

Year.	Wheat.		Rye.		Oats.		Barley.		Corn.	
	Area.	Average yield.	Area	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*
1884...	2,735,600	15.5	4,896,900	15.1	4,532,900	26.4	2,655,600	19.8	895,300	18.3
1885...	2,950,600	16.0	4,928,400	15.7	4,519,600	22.9	2,882,300	18.4	908,500	22.2
1886...	2,900,800	15.0	4,970,100	14.9	4,616,300	27.3	2,762,600	19.9	895,900	21.5
1887...	2,876,500	18.0	4,969,700	18.0	4,632,600	25.1	2,798,900	21.7	892,000	18.2
1888...	2,930,000	17.4	4,979,200	16.1	4,630,900	25.1	2,795,800	21.5	897,300	18.6
1889...	2,704,400	13.9	4,876,000	14.2	4,639,300	18.9	2,812,800	16.9	943,700	17.8
1890...	2,835,000	15.1	4,941,600	16.0	4,630,100	24.9	2,757,600	20.6	919,000	21.4
1891...	2,747,900	14.4	4,794,800	14.0	4,679,300	25.7	2,815,800	20.2	923,200	21.2
1892...	2,780,400	17.8	4,865,800	17.0	4,628,700	26.9	2,747,000	23.6	907,800	21.8
1893...	2,766,500	15.4	4,800,800	15.9	4,551,600	21.0	2,777,400	19.4	886,400	17.8
1894...	2,713,000	17.4	4,822,000	17.2	4,643,400	26.0	2,806,900	22.3	806,000	17.0
1895...	2,628,600	15.3	4,477,200	14.5	4,817,600	26.1	2,949,500	20.9	859,400	21.9
1896...	2,615,800	16.0	4,537,800	16.3	4,737,500	23.3	2,911,200	19.4	854,600	20.7
1897...	2,615,100	13.2	4,543,600	13.9	4,724,100	21.5	2,899,200	17.6	829,700	18.0
1898...	2,609,300	18.0	4,513,600	17.7	4,697,900	27.4	2,886,000	22.0	841,500	19.5
1899...	2,649,200	19.0	4,549,800	18.7	4,613,800	30.2	2,939,100	24.9	825,200	17.5
1900...	2,632,400	15.5	4,206,000	13.0	4,692,100	25.2	3,049,500	20.2	827,800	18.7
1901...	2,643,400	16.7	4,474,400	16.9	4,622,400	25.6	2,991,900	22.4	820,700	21.4
1902...	2,614,100	19.0	4,527,300	18.2	4,528,000	27.7	3,005,000	24.6	819,200	16.4
1903...	2,600,600	17.8	4,465,600	18.2	4,530,500	28.3	2,977,600	24.8	824,200	19.5
1904...	2,754,900	19.5	4,760,200	19.3	4,501,500	24.3	2,926,300	22.8	836,200	15.0
1905...	2,782,300	19.6	4,864,600	20.2	4,467,600	27.7	2,935,900	24.0	861,100	20.1
1906...	2,880,400	20.2	4,997,200	19.9	4,529,200	34.1	2,909,900	26.1	836,200	20.7

The official records for Austria are continuous from 1884 to 1906, twenty-three years. They show a remarkable uniformity in acreage in wheat, rye, oats, barley, and corn, and no evidence of decrease in productivity in any of these crops.

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Acreage and yields of cereals in Hungary, 1883–1906, by years.

Year.	Wheat.		Rye.		Oats.		Barley.		Corn.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]
1883...	6,438,300	14.1	2,714,900	14.8	2,453,000	20.9	2,402,600	16.4	4,507,500	19.4
1884...	6,797,800	15.8	2,729,400	15.7	2,457,800	23.2	2,459,600	19.0	4,585,300	19.7
1885...	7,172,100	16.6	3,061,200	14.7	2,841,600	20.9	2,757,100	20.6	5,396,000	22.3
1886...	7,229,800	15.0	3,048,900	13.4	2,876,400	20.8	2,751,100	14.7	5,502,400	17.7
1887...	7,275,200	20.8	3,035,300	17.9	2,857,400	23.0	2,650,100	21.9	5,291,000	15.9
1888...	7,277,500	19.5	2,992,000	15.1	2,846,300	21.2	2,590,100	18.3	5,398,900	20.1
1889...	7,636,800	12.9	2,931,900	13.5	2,757,000	16.7	2,645,800	13.7	5,585,600	20.5
1890...	7,824,300	19.8	2,942,600	18.1	2,692,600	21.1	2,654,200	20.8	5,589,000	18.4
1891...	7,929,700	18.4	2,798,500	14.1	2,722,300	25.2	2,739,300	20.8	5,830,000	27.7
1892...	8,085,800	18.5	2,973,800	16.5	2,714,700	24.3	2,743,500	19.7	6,031,000	21.9
1893...	8,648,500	19.5	3,269,400	17.9	2,625,400	29.2	2,749,600	24.4	5,941,500	25.8
1894...	8,483,900	18.2	2,991,900	19.5	2,664,600	30.1	2,780,600	22.7	5,898,000	14.0
1895...	8,304,800	20.7	2,802,800	16.7	2,593,600	29.6	2,658,400	21.4	6,208,300	26.5
1896...	8,311,200	19.4	2,807,200	18.2	2,546,700	31.4	2,666,200	24.0	6,049,200	24.7
1897...	7,444,800	11.7	2,691,300	13.5	2,450,400	24.3	2,507,300	17.6	5,793,100	20.5
1898...	8,160,100	17.1	2,735,400	16.9	2,587,300	33.1	2,583,600	23.6	6,191,900	23.9
1899...	8,438,000	17.8	2,816,400	17.7	2,626,900	33.3	2,681,400	24.0	6,169,300	21.2
1900...	8,807,000	17.3	2,752,100	15.4	2,672,700	28.5	2,667,700	21.3	6,396,100	22.9
1901...	8,866,300	15.2	2,795,000	15.6	2,674,300	27.6	2,680,800	19.8	6,392,200	23.1
1902...	8,950,300	20.4	2,803,700	18.7	2,679,400	33.3	2,695,700	24.3	6,287,800	19.1
1903...	9,227,000	19.1	2,801,700	18.1	2,776,500	34.1	2,746,800	24.9	6,579,000	24.2
1904...	9,131,300	16.1	2,760,400	16.6	2,703,700	25.0	2,693,800	19.4	5,828,600	12.1
1905...	9,197,700	18.5	2,790,900	19.0	2,759,300	30.5	2,722,400	24.0	6,235,400	18.0
1906...	9,526,600	21.8	[b]2,802,400	19.4	2,815,700	33.4	2,769,800	26.3	6,731,800	28.0

[a] Prior to 1893, Winchester bushels.
[b] Including maslin in Hungary proper.

The records for Hungary from 1883 to 1906, twenty-four years, show an increasing acreage in wheat and corn of, roughly, 33 and 50 per cent, respectively, and a practically constant acreage in rye, oats, and barley. There is no evidence of decreased productivity of any of these crops, but on the contrary fair evidence of increased productivity.

Acreage and yields of cereals in Belgium, 1880–1905, by years.

Year.	Wheat.			Rye.		Oats.		Barley.		
	Area.	Average yield.		Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	
		Winter.	Spring.						Winter.	Spring.
	Acres.	*Bush.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Bush.*
1880	681,800	26.6	23.7	686,100	26.5	616,500	48.6	99,300	36.0	31.4
1881	666,000	22.4	19.5	687,000	20.9	616,000	38.7	99,300	35.4	27.9
1882	650,000	25.7	19.9	688,000	26.0	616,000	44.5	99,300	38.6	29.1
1883	635,000	25.0	22.1	689,000	23.9	616,000	41.1	99,300	37.6	31.1
1884	619,000	25.9	22.0	690,000	26.4	616,000	45.4	99,300	42.3	33.8
1885	603,000	27.5	22.7	691,000	26.1	616,000	46.4	99,300	42.7	32.1
1886	587,000	27.0	22.9	692,000	22.4	616,000	52.4	99,400	39.3	35.8
1887	572,000	29.8	....	693,000	27.7	616,000	42.0	99,400	43.9	32.0
1888	556,000	21.9	19.3	694,000	21.7	615,000	50.1	99,400	35.1	32.8
1889	540,000	28.2	21.8	695,000	26.6	615,000	49.2	99,400	40.4	32.9
1890	524,000	28.6	23.2	696,000	28.7	615,000	55.2	99,400	45.4	34.5
1891	509,000	23.0	26.0	696,000	22.4	615,000	59.3	99,400	34.3	38.3
1892	493,000	31.2	25.9	697,000	33.3	615,000	49.2	99,400	44.9	36.9
1893	477,000	27.7	22.7	698,000	28.0	615,000	35.1	99,400	38.8	29.4
1894	461,000	28.4	22.5	699,000	30.5	615,000	50.6	99,400	40.6	32.0
1895	445,700	28.8	25.5	700,200	30.4	614,500	55.8	99,400	43.6	32.0
1896	440,000	30.7	23.7	681,000	32.3	617,000	46.4	99,000	44.6	33.5
1897	434,000	26.9	24.0	662,000	29.5	619,000	54.9	98,000	37.3	31.1
1898	429,000	31.7	22.8	644,000	29.6	621,000	66.8	97,000	42.2	33.9
1899	423,000	26.2	20.4	625,000	26.5	624,000	53.3	96,000	42.3	39.8
1900	417,500	33.0		605,800	32.8	625,800	62.6	95,000	50.1	
1901	409,700	34.5		620,400	34.1	615,800	65.9	94,600	51.3	
1902	415,700	34.9		654,900	34.2	646,200	70.5	93,900	52.9	
1903	355,400	34.7		626,800	34.7	705,800	68.5	79,800	49.2	
1904	393,200	35.1		639,300	34.4	613,300	61.1	98,800	50.7	
1905	402,500	30.8		659,700	32.4	586,500	57.6	94,400	47.9	

The records for Belgium are continuous from 1880 to 1905, twenty-six years, with a decrease of about one-third in the area in wheat, and a nearly constant acreage in rye, oats, and barley, with no indication of decreased productivity for any of these crops.

Acreage and yields of cereals in Denmark, 1883–1905, by years.

Year.	Wheat.		Rye.		Oats.		Barley.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]
1883	132,900	33.9	670,700	26.4	1,010,500	30.2	769,800	27.1
1884	130,300	36.0	675,400	24.7	1,019,900	30.4	763,100	27.2
1885	127,700	40.1	680,000	26.3	1,027,400	33.1	756,400	27.6
1886	125,100	37.7	684,700	24.2	1,035,800	34.1	749,800	31.0
1887	122,500	43.7	689,300	25.0	1,044,300	30.5	743,100	29.4
1888	119,900	27.4	694,000	23.6	1,052,700	33.7	736,400	30.1
1889	115,600	36.3	697,000	26.0	1,056,900	26.5	730,800	25.5
1890	111,200	33.9	700,100	24.3	1,061,000	35.2	725,100	32.3
1891	106,800	39.1	703,100	27.8	1,065,200	32.3	719,500	31.5
1892	102,500	41.6	706,100	28.9	1,069,300	38.1	713,800	34.6
1893	98,100	39.3	709,100	27.7	1,073,500	25.9	708,200	24.4
1894	93,700	34.8	712,200	23.4	1,077,600	35.6	702,500	30.3
1895	89,400	38.8	715,200	25.7	1,081,700	37.2	696,900	31.3
1896	85,000	43.4	718,200	28.0	1,085,900	35.5	691,200	30.7
1897	....	40.9	....	25.2	....	32.4	....	27.7
1898	....	35.2	....	22.5	....	38.2	....	31.6
1899	....	43.0	....	25.6	....	34.1	....	31.4
1900	....	42.4	....	27.8	....	37.1	....	33.0
1901	32,200	29.2	673,400	24.7	1,069,100	35.0	695,300	32.0
1902		44.7		27.9		38.6		35.5
1903	[b]101,200	44.1	[b]674,300	28.6	[b]1,057,100	39.0	[b]656,600	35.5
1904		42.5		24.5		36.1		34.6
1905		40.3		28.5		30.9		32.2

[a] Winchester bushels.
[b] Area returned by the census of 1901 as intended for the crop named at the time of fall planting; the area actually harvested in 1901, owing to the failure of the wheat crop, differed considerably from these figures.

The estimates of the yield per acre for Denmark are continuous from 1883 to 1905, twenty-three years, and show no tendency to decline. The record of area is not complete, but indicates a considerable decrease for wheat and a fairly constant area in rye, oats, and barley.

Acreage and yields of cereals in France, 1883–1906, by years.

Year.	Wheat.		Rye.		Oats.		Barley.		Corn.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*
1883	16,812,500	17.3	4,249,400	16.4	9,215,700	32.9	2,633,000	22.5	1,556,500	17.7
1884	17,426,300	18.6	4,263,800	17.3	9,135,700	31.2	2,613,100	21.7	1,523,800	18.4
1885	17,190,400	18.2	4,133,900	16.6	9,117,200	30.7	2,361,400	21.7	1,386,000	18.4
1886	17,189,000	17.6	4,038,400	15.8	9,232,000	31.5	2,339,300	22.6	1,357,400	18.7
1887	17,216,900	18.6	4,013,700	16.6	9,192,600	28.2	2,309,000	21.7	1,379,600	21.6
1888	17,243,200	16.0	4,024,900	15.5	9,227,500	29.3	2,208,400	20.8	1,412,100	20.0
1889	17,393,600	17.6	3,952,400	16.5	9,287,500	29.6	2,158,500	21.2	1,379,700	18.9
1890	17,449,800	19.0	3,925,600	17.4	9,342,300	32.6	2,168,400	23.0	1,350,700	17.4
1891	14,220,400	15.2	3,703,000	16.4	10,483,900	32.6	3,022,500	24.7	1,377,900	19.4
1892	17,264,200	18.0	3,809,900	1 . 6	9,421,700	28.5	2,263,700	21.2	1,381,100	19.5
1893	17,477,800	15.9	3,781,000	17.0	9,495,000	20.7	2,161,300	16.6	1,402,200	18.8
1894	17,276,200	19.9	3,844,300	19.5	9,591,100	30.7	2,200,000	22.6	1,428,900	19.4
1895	17,301,400	19.6	3,789,400	19.0	9,807,400	31.2	2,200,900	22.6	1,444.400	18.3
1896	16,976,900	20.0	3,707,100	18.8	9,677,300	30.6	2,110,000	22.5	1,442,400	21.2
1897	16,268,800	14.9	3,587,300	13.3	9,860,800	25.7	2,119,900	19.6	1,445,500	21.2
1898	17,207,600	21.2	3,644,600	18.4	9,606,200	33.5	2,012,600	24.1	1,388,000	17.2
1899	17,149,500	21.3	3,679,100	18.3	9,734,200	31.6	1,992,300	23.7	1,386,400	18.5
1900	16,961,400	19.2	3,508,300	16.9	9,739,400	29.3	1,871,100	22.6	1,337,300	16.8
1901	16,787,700	18.5	3,489,400	16.7	9,601,700	26.5	1,838,700	21.8	1,351,900	19.9
1902	16,219,200	20.2	3,290,800	13.9	9,469,400	33.8	1,714,700	25.4	1,242,000	20.3
1903	16,009,200	22.7	3,205,500	18.1	9,498,100	36.3	1,722,500	26.2	1,239,500	20.8
1904	16,133,200	18.6	3,144,300	16.8	9,475,500	30.7	1,741,300	22.6	1,224,600	16.2
1905	16,085,800	20.8	3,136,900	18.7	9,420,100	32.5	1,746,200	24.1	1,241,400	19.6
1906	16,103,200	20.4	3,095,100	16.4	9,525,600	31.0	1,752,800	21.6	....	......

The records for France are continuous for corn from 1883 to 1905, and for the other crops from 1883 to 1906, twenty-four years. The area in wheat, oats, and corn has been fairly constant, while that in rye and barley has considerably decreased. The yield per acre for none of the crops shows any tendency to decrease during this period. From the long-time records from 1815 to 1876, in a table on page 14, as taken from the official report of the French minister of agriculture and antedating this period of twenty-four years, there had been a considerable increase in productivity of the soils of France, particularly prior to 1860.

Acreage and yields of cereals in Germany, 1883–1906, by years.

Year.	Wheat.		Rye.		Oats.		Barley.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*
1883	4,760,300	18.2	14,399,000	15.4	9,323,700	27.6	4,326,500	22.7
1884	4,755,400	19.2	14,447,200	14.9	9,336,400	31.4	4,287,900	23.9
1885	4,742,600	20.2	14,435,500	15.9	9,357,400	32.1	4,305,500	24.2
1886	4,736,100	20.7	14,428,200	16.6	9,406,100	35.6	4,278,600	25.1
1887	4,743,600	21.9	14,436,500	17.4	9,415,300	31.5	4,277,700	23.7
1888	4,777,300	19.5	14.367,300	15.1	9,470,200	33.8	4,257,900	24.4
1889	4,834,400	18.0	14,336,700	14.7	9,604,000	30.1	4,163,700	21.4
1890	4,843,700	21.5	14,382,200	16.1	9,647,000	35.1	4,112,300	25.5
1891	4,658,700	18.4	13,540,500	13.9	10,266,400	35.4	4,464,400	25.9
1892	4,881,900	23.8	14,032,300	19.2	9,853,800	33.2	4,176,300	26.6
1893	5,051,100	24.8	14,856,600	23.7	9,654,300	29.8	4,020,500	27.7
1894	4,893,900	25.0	14,936,400	22.0	9,678,400	46.8	4,023,000	33.1
1895	4,771,200	24.4	14,563,300	20.9	9,955,100	43.2	4,177,500	31.3
1896	4,761,400	26.4	14,782,200	22.7	9,833,900	41.8	4,142,300	30.8
1897	4,746,000	25.3	14,744,100	21.8	9,881,800	39.9	4,116,800	29.1
1898	4,866,200	27.2	14,690,800	24.2	9,875,600	47.1	4,102,200	32.2
1899	4,982,800	28.4	14,507,600	23.5	9,883,500	48.0	(a)	(a)
1900	5,063,500	27.9	14,715,000	22.9	10,187,600	48.0	(a)	(a)
1901	3,907,800	23.5	14,362,100	22.4	10,900,800	44.6	(a)	(a)
1902	4,725,200	30.3	15,208,100	24.6	10,270,400	50.1	(a)	(a)
1903	4,466,300	29.2	14,857,900	26.2	10,601,700	51.2	(a)	(a)
1904	4,738,300	29.5	15,071,500	26.3	10,352,900	46.2	(a)	(a)
1905	4,762,000	28.5	15,186,000	24.9	10,334,000	43.6	(a)	(a)
1906	4,783,900	30.3	15,077,200	25.1	10,431,600	55.7	(a)	(a)

[a] Not estimated officially.

The records compiled by the bureau of statistics for Germany cover the period from 1883 to 1906, twenty-four years. The area in rye and oats appears to have slightly increased, and that in wheat to have been constant. The estimates for barley are given only until 1898. The yields of wheat, rye, oats, and barley show no tendency to decrease, but, on the contrary, indicate a considerable general increase in productivity, agreeing with opinions, quoted above, of those who have looked into the matter of individual farm records that the productivity of the soils in Germany has increased considerably within historic times. There is certainly no evidence to show a general decrease in productivity.

Acreage and yields of cereals in Italy, 1883–1905, by years.

Year.	Wheat.		Rye.		Oats.		Barley.		Corn.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]
1883 [b]	10,956,600	12.1	395,400	13.2	1,079,900	17.0	835,200	13.1	4,675,200	18.0
1884										
1885										
1886										
1887										
1888										
1889										
1890	10,889,900	12.1	348,400	12.7	1,119,400	17.0	820,400	13.4	4,724,600	15.9
1891	11,124,600	12.7	350,900	13.1	1,107,000	18.0	761,100	12.7	4,709,800	15.4
1892	11,193,800	10.3	355,800	11.9	1,112,000	15.5	773,400	10.3	4,702,400	15.3
1893	11,258,100	12.0	358,300	12.6	1,131,700	16.1	798,100	9.9	4,744,400	17.4
1894	11,302,500	10.8	350,900	12.3	1,151,500	14.8	748,700	11.1	4,697,400	12.7
1895	11,349,500	10.4	338,600	11.8	1,171,300	16.4	733,900	10.1	4,835,800	14.6
1896	11,319,800	12.8					761,100	13.2	4,833,400	16.5
1897										
1898										
1899										
1900										
1901	11,910,400	13.8							4,336,700	23.2
1902	11,737,400	11.6							4,200,800	16.9
1903	11,984,500	15.4							4,171,100	21.3
1904	13,336,200	12.6							4,796,800	19.5
1905	13,134,300	12.2							4,845,500	20.2

[a] Winchester bushels. [b] Average, 1879–1883.

The records for Italy from 1883 to 1905 are fragmentary. So far as they go they give no indication of a decline in productivity.

Acreage and yields of cereals in the Netherlands, 1883–1905, by years.

Year.	Wheat.		Rye.		Oats.		Barley.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]
1883	214,100	26.3	493,000	22.0	295,200	38.7	120,000	42.6
1884	219,300	26.9	498,500	21.3	278,300	40.5	116,400	42.0
1885	209,500	30.2	503,800	23.0	283,100	46.1	122,600	44.7
1886	199,300	26.3	503,400	21.3	300,400	48.8	110,100	42.8
1887	210,500	32.7	504,100	27.3	285,300	42.5	111,400	47.0
1888	209,200	25.1	500,200	19.7	281,900	44.5	111,100	38.3
1889	211,000	30.7	501,500	22.6	284,100	47.1	109,700	44.2
1890	200,600	25.9	503,100	22.1	284,300	46.6	104,400	39.8
1891	144,800	24.2	453,500	18.3	377,400	49.1	111,800	40.0
1892	183,400	29.3	495,800	25.1	312,400	48.0	107,700	46.3
1893	175,000	28.4	499,100	24.8	312,200	39.5	103,500	46.1
1894	159,600	26.1	514,700	23.9	327,400	46.1	94,900	38.2
1895	152,900	28.0	519,100	24.7	323,700	48.0	95,700	44.8
1896	153,900	32.8	531,100	25.6	317,400	48.3	97,200	47.0
1897	153,700	27.9	527,400	22.6	331,400	48.7	89,800	41.6
1898	180,600	29.9	530,100	25.8	314,100	52.9	87,000	43.9
1899	177,500	28.7	528,500	24.5	316,800	50.7	87,800	45.2
1900	157,800	29.6	528,900	25.8	324,700	53.3	94,400	48.5
1901	134,600	31.4	532,900	26.6	334,400	55.3	88,700	43.7
1902	152,400	33.5	539,300	25.9	339,800	56.6	90,100	51.6
1903	137,200	31.0	539,000	25.9	357,100	56.3	78,900	48.5
1904	133,600	33.1	534,000	25.3	357,700	52.0	76,300	47.2
1905	150,700	33.7	541,700	25.4	325,800	49.3	81,700	49.1

[a] Winchester bushels.

The records for the Netherlands are complete from 1883 to 1905, twenty-three years. The yields give no indication of decline. The

area in wheat and barley has decreased considerably; that in rye and oats appears to have slightly increased.

Acreage and yields of cereals in Roumania, 1886–1906, by years.

Year.	Wheat.		Rye.		Oats.		Barley.		Corn.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]
1886	2,903,700	11.9	570,800	11.2	560,700	17.5	1,371,200	10.6	4,234,400	17.1
1887	2,791,500	17.0	586,600	13.0	582,200	21.2	1,504,600	12.4	4,560,600	10.7
1888	3,104,400	18.6	743,500	19.7	528,600	20.4	1,251,600	18.4	4,283,500	14.7
1889	3,310,900	15.1	424,500	13.5	483,800	13.6	1,263,900	12.5	4,435,800	15.6
1890	3,730,500	13.9	412,900	11.4	441,100	17.2	1,280,200	12.6	4,307,300	14.1
1891	3,811,600	12.7	301,200	12.9	456,900	16.9	1,299,500	17.1	4,184,200	14.3
1892	3,696,900	17.3	328,900	14.1	557,700	19.8	1,384,300	14.9	4,502,500	20.5
1893	3,221,200	18.9	353,400	21.8	622,300	24.8	1,467,600	24.4	4,544,700	16.0
1894	3,441,300	12.7	395,400	14.6	649,100	15.4	1,381,900	12.2	4,367,700	6.8
1895	3,553,400	19.3	537,600	17.2	668,500	15.5	1,365,600	16.4	4,560,300	15.6
1896	3,719,400	19.1	601,500	20.3	696,500	21.1	1,501,700	21.2	4,791,500	13.7
1897	3,941,500	9.2	582,600	11.7	712,000	13.8	1,673,400	12.7	4,583,500	17.4
1898	3,591,900	16.3	477,100	16.0	756,000	23.0	1,618,200	18.3	5,238,800	19.5
1899	4,105,300	6.3	467,900	4.2	766,500	8.2	1,578,200	2.9	4,983,600	5.6
1900	3,927,700	14.4	405,900	14.8	630,800	13.8	1,084,500	13.5	5,029,200	16.9
1901	4,044,000	17.9	522,400	18.3	655,100	25.2	1,244,700	19.5	5,258,400	22.2
1902	3,673,200	20.8	427,000	16.3	793,500	27.6	1,254,700	19.7	5,391,500	12.7
1903	3,967,600	18.6	390,500	18.3	1,054,500	29.8	1,311,900	22.7	5,120,200	15.7
1904	4,254,700	12.6	330,900	6.7	1,052,000	12.0	1,320,100	8.8	5,173,800	3.8
1905	4,838,900	21.4	398,300	33.7	921,000	20.6	1,306,600	21.9	4,882,200	12.1
1906	4,998,500	22.8	454,500	19.6	943,700	27.7	1,380,600	24.3	5,144,500	25.4

[a] Winchester bushels.

The records for Roumania, one of the oldest agricultural countries of Europe, are complete from 1886 to 1906, twenty-one years. The area in wheat, oats, and corn has considerably increased, while that for rye and barley has remained fairly constant. The yields have varied considerably from season to season, thus wheat yielded only 6.3 bushels in 1899, but gave 22.8 bushels in 1906. Rye gave only 4.2 bushels in 1899, but gave 33.7 bushels in 1905. Oats gave 8.2 bushels in 1899, but gave 29.8 bushels in 1903. Barley gave only 2.9 bushels in 1899, but gave 24.4 bushels in 1893 and 24.3 bushels in 1906. Corn gave only 3.8 bushels in 1904 and 5.6 bushels in 1899, but gave 25.4 bushels in 1906. There is no indication whatever of any systematic decline in productivity during this period of twenty-one years, but, on the contrary, the indications are that there has been an increase.

Acreage and yields of cereals in Russia, 1883–1905, by years.

Year.	Wheat.		Rye.		Oats.		Barley.		Corn.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*
1883		7.9		8.5		16.5		10.9		13.1
1884		9.3		10.7		14.3		10.8		11.0
1885	28,879,300	6.2	64,604,600	10.9	34,882,800	11.2	12,441,600	8.1	1,487,800	11.6
1886		5.7		10.3		16.3		10.7		15.3
1887		9.7		11.5		17.7		13.5		8.7
1888		10.3		10.9		15.4		12.7		
1889		6.5		8.3		14.3		8.9		
1890	30,601,300	6.5	68,936,000	9.2	36,590,800	15.7	14,397,800	11.0	(*a*)	(*a*)
1891		5.2		6.8		12.4		9.4		
1892	32,440,700	7.1	63,200,300	8.8	34,100,200	13.7	15,485,900	10.9		
1893	32,434,000	10.9	61,961,900	11.1	33,138,000	21.2	15,787,200	18.8	2,258,600	18.0
1894	32,852,200	10.3	63,230,200	12.8	32,846,500	21.4	15,756,200	15.0	2,089,600	9.3
1895	31,894,300	9.2	62,595,300	11.5	33,973,300	19.8	15,808,600	13.3	1,917,600	13.0
1896	34,848,300	8.6	64,238,400	10.9	35,571,600	18.8	16,860,000	12.4	2,184,000	7.9
1897	35,606,400	6.7	62,646,600	9.1	36,206,500	15.1	17,218,800	11.8	2,211,500	20.6
1898	36,007,500	9.3	62,283,400	10.2	35,658,500	15.7	17,589,800	14.5	2,351,600	16.8
1899	38,045,200	8.3	63,405,600	12.7	36,112,400	23.3	17,460,300	10.3	2,406,100	9.4
1900	39,966,900	8.0	65,738,400	12.6	37,399,300	19.9	17,585,400	10.6	2,709,400	9.4
1901	41,921,000	7.6	65,950,300	10.3	37,999,800	13.9	18,128,100	10.4	2,701,100	22.5
1902	42,590,200	10.9	65,871,400	12.3	37,252,400	21.7	18,224,400	15.1	2,860,700	14.1
1903	43,753,200	10.4	66,511,200	12.1	37,590,400	17.3	19,247,000	15.1	2,760,000	14.6
1904	45,635,300	11.4	65,643,600	13.6	37,783,100	26.6	20,069,200	14.5	2,901,300	6.5
1905	48,071,200	9.4	64,689,600	9.7	38,605,700	19.9	20,236,000	13.5	2,870,400	7.9

a Statistics corresponding to those of production not available.

The records for Russia are complete, so far as the yields per acre are concerned, from 1883 to 1905 for wheat, rye, oats, and barley, but incomplete for the yield of corn and for the acreage in all the crops. So far as can be seen, the acreage in most of the crops has increased and there is no indication of a decline in productivity.

Acreage and yields of cereals in Servia, 1893–1906, by years.

Year.	Wheat.		Rye.		Oats.		Barley.		Corn.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*
1893	783,500	11.1	147,800	8.9	261,800	12.5	227,600	11.1	1,314,100	13.8
1897	691,300	19.4	91,900	20.7	247,300	39.6	185,200	22.9	1,107,900	30.8
1898	695,900	14.0	111,700	14.2	235,100	27.4	237,200	16.9	1,235,700	22.8
1899	997,900	11.7	146,100	11.4	250,100	19.8	281,400	13.8	1,148,500	19.2
1900	766,100	10.6	87,900	7.7	210,600	12.7	184,900	12.2	1,344,900	16.1
1901	753,200	10.8	93,300	9.5	226,200	14.8	195,000	12.1	1,251,500	15.1
1902	804,600	14.2	98,400	11.0	248,100	16.3	217,900	16.0	1,296,400	14.2
1903	860,100	12.7	105,100	10.4	267,600	16.4	234,900	14.6	1,319,100	14.8
1904	905,400	12.9	111,500	9.2	259,100	12.2	244,700	12.9	1,336,600	7.1
1905	919,600	12.3	117,500	9.4	258,200	13.7	266,300	13.8	1,365,300	15.5
1906	921,400	14.3	120,200	13.0	261,500	17.7	270,200	17.6	1,354,500	20.7

The records for Servia are available only from 1893 to 1906. The acreages in wheat, rye, oats, barley, and corn are fairly constant, while the yields show at least no decrease.

The same holds true for Spain with wheat, rye, barley, oats, and corn from 1890 to 1905, with some omission of yearly data; for Sweden with wheat, rye, oats, and barley from 1890 to 1905; and for Switzerland with wheat, rye, and barley from 1888 to 1905.

Acreage and yields of cereals in Spain, 1890–1905, by years.

Year.	Wheat.		Rye.		Barley.		Oats.		Corn.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[b]	*Acres.*	*Bush.*[b]	*Acres.*	*Bush.*[b]	*Acres.*	*Bush.*[b]
1890	8,558,200	8.8	1,709,200	10.5	3,787,100	10.1	......	......	660,300	24.3
1892	8,366,800	10.4	......	......	......	......	......	......	......	......
1893	7,954,200	11.8	......	......	......	......	......	......	......	......
1894	8,252,100	13.3	1,518,100	11.5	2,518,200	23.0	730,100	17.0	826,000	23.1
1895	7,855,900	10.8	1,488,000	11.7	2,429,300	17.7	653,600	13.6	793,800	19.8
1896	7,825,200	10.1	1,674,200	9.2	2,360,600	13.8	683,100	11.5	993,300	18.4
1897	9,532,600	9.7	1,911,800	9.9	3,109,400	14.7	874,800	26.5	1,095,500	18.0
1898	9,543,100	13.1	1,775,800	11.9	3,689,900	19.7	938,000	18.1	1,036,000	14.7
1899	9,052,500	10.8	1,848,800	11.5	3,465,200	15.6	932,000	16.2	1,160,200	22.1
1900	9,559,700	10.5	1,799,000	11.9	3,432,400	16.5	937,200	17.5	1,175,700	22.1
1901	9,172,300	14.9	1,969,000	14.4	3,301,200	24.2	944,200	24.1	1,156,100	22.3
1902	9,150,100	14.6	1,937,900	13.5	3,599,900	22.6	1,111,800	21.0	1,142,700	22.1
1903	8,983,500	14.4	1,930,800	11.7	3,539,800	18.2	1,115,900	20.6	921,000	20.4
1904	9,023,000	10.6	1,889,900	9.1	3,413,900	15.8	1,103,400	16.7	1,072,600	19.8
1905	8,879,200	10.4	1,854,200	14.3	3,336,200	13.8	1,119,400	19.9	1,148,900	27.7

[a] In 1890, bushels of capacity.
[b] Prior to 1897, bushels of capacity.

Acreage and yields of cereals in Sweden, 1890–1905, by years.

Year.	Wheat.		Rye.		Oats.		Barley.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]
1890	174,400	23.2	964,500	22.4	1,979,200	32.0	546,200	27.0
1891	175,400	24.7	978,200	22.0	1,992,100	26.4	546,600	23.9
1892	176,300	24.6	987,900	23.3	2,010,800	32.1	550,100	25.2
1893	174,700	22.3	994,600	23.5	2,021,200	27.9	540,300	23.9
1894	175,100	24.9	994,100	19.4	2,022,000	31.4	540,700	26.4
1895	175,800	21.1	997,100	19.2	2,044,600	31.0	542,600	25.7
1896	176,200	26.7	1,007,500	23.0	2,023,000	26.2	538,700	25.2
1897	178,100	26.3	1,012,300	22.7	2,033,100	26.6	542,100	25.2
1898	182,800	25.2	1,014,200	20.4	2,034,700	32.0	545,700	27.2
1899	186,400	24.4	1,012,400	20.0	2,027,500	24.9	545,400	22.9
1900	192,500	28.0	1,015,800	23.3	2,038,200	30.7	537,600	25.7
1901	195,100	21.5	1,013,800	21.5	2,040,100	27.1	537,800	23.7
1902	202,400	23.5	1,017,200	21.9	2,036,100	28.2	531,400	23.1
1903	200,600	27.6	1,013,800	23.0	2,036,300	29.3	528,900	25.7
1904	199,900	25.7	1,016,500	20.4	2,045,900	25.2	526,300	25.6
1905	205,700	26.9	1,014,100	24.1	2,030,800	28.8	514,000	25.0

[a] Winchester bushels.

Acreage and yields of cereals in Switzerland, 1888–1905, by years.

Year.	Wheat.		Rye.		Oats.		Barley.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*
1888		19.7		25.7		46.7		27.0
1889	183,000	19.5	77,000	22.2	136,000	43.4	30,000	25.4
1890		24.6		27.8		47.5		28.1
1891		24.2		25.6		48.6		27.5
1892	174,000	25.0	79,000	28.7	139,000	45.6	30,000	27.5
1893		18.8		22.5		30.3		22.0
1894		23.7		24.8		43.2		25.6
1895	165,000	20.9	79,000	21.5	135,000	43.5	27,000	25.0
1896		17.9		19.7		38.8		21.3
1897	160,000	21.5	88,000	23.0	144,000	44.0	27,000	24.2
1898	164,000	24.5	88,000	24.2	141,000	48.0	27,000	26.6
1899		24.7		25.9		47.9		25.8
1900		25.1		25.4		46.8		26.7
1901	164,000	22.0	88,000	24.0	140,000	41.3	27,000	24.4
1902		24.3		24.8		47.1		26.2
1903		25.9		26.6		49.4		28.0
1904	157,000	24.7	92,000	26.9	137,000	48.4	20,000	27.7
1905		22.3		24.9		45.4		25.9

Acreage and yields of cereals in Great Britain, 1883–1906, by years.

Year.	Wheat.		Barley.		Oats.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*[a]	*Acres.*	*Bush.*[a]	*Acres.*	*Bush.*[a]
1883	2,613,200	....	2,292,000	....	2,975,400	....
1884	2,677,000	30.9	2,168,800	35.2	2,915,400	38.7
1885	2,478,300	32.3	2,257,300	36.2	2,940,500	38.0
1886	2,285,900	27.7	2,241,200	33.2	3,081,600	39.0
1887	2,317,300	33.1	2,085,200	32.3	3,088,000	35.8
1888	2,564,200	28.9	2,085,600	33.9	2,882,300	38.4
1889	2,449,400	30.8	2,121,500	32.8	2,888,700	40.5
1890	2,386,300	31.7	2,111,200	36.1	2,903,000	42.7
1891	2,307,300	32.2	2,112,800	35.2	2,899,100	40.0
1892	2,219,800	27.2	2,036,800	35.7	2,997,500	40.0
1893	1,897,500	26.8	2,075,100	29.6	3,171,800	36.7
1894	1,928,000	31.7	2,095,800	35.6	3,253,400	42.9
1895	1,417,500	27.1	2,166,300	32.7	3,296,100	38.2
1896	1,694,000	34.7	2,104,800	34.7	3,095,500	38.0
1897	1,889,200	30.0	2,035,800	33.9	3,036,100	39.7
1898	2,102,200	35.8	1,903,700	36.9	2,917,800	42.0
1899	2,001,000	33.8	1,982,100	35.2	2,959,800	40.0
1900	1,845,000	29.4	1,990,300	32.3	3,026,100	39.1
1901	1,700,800	31.8	1,972,400	32.0	2,996,900	37.9
1902	1,726,400	33.9	1,909,400	35.9	3,057,000	44.0
1903	1,581,500	31.1	1,858,500	33.0	3,140,200	41.0
1904	1,375,200	27.7	1,840,700	32.1	3,252,900	40.4
1905	1,796,800	33.8	1,713,700	35.0	3,051,400	39.4
1906	1,755,600	34.7	1,751,200	35.7	3,043,000	41.8

[a] Winchester bushels.

The records given for Great Britain from 1883 to 1906, twenty-four years, show a decrease in acreage for wheat and barley and fairly constant acreage in oats. There is no indication of any decline in productivity.

Acreage and yields of cereals in Ireland, 1883–1906, by years.

Year.	Wheat.		Barley.		Oats.		Rye.	
	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.	Area.	Average yield.
	Acres.	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*	*Acres.*	*Bush.*
1883	94,700	25.5	183,600	35.9	1,381,900	47.7	7,200	22.9
1884	67,900	27.3	167,400	37.4	1,348,400	47.0	7,100	22.2
1885	71,000	28.8	179,500	37.6	1,328,900	47.8	8,400	25.4
1886	69,500	27.0	181,900	35.6	1,322,000	48.7	10,600	23.2
1887	67,200	28.3	162,400	29.8	1,315,100	40.3	10,800	21.6
1888	99,000	25.8	171,300	36.9	1,280,900	48.2	13,900	26.8
1889	89,700	29.9	186,300	40.7	1,239,000	49.8	15,800	25.8
1890	92,300	28.6	182,400	39.2	1,221,000	51.0	14,600	23.2
1891	80,900	32.3	178,300	43.4	1,215,400	54.2	13,400	27.1
1892	75,400	29.4	175,600	38.3	1,226,200	51.6	13,100	25.1
1893	55,000	30.3	169,000	38.3	1,248,300	54.4	13,500	26.5
1894	49,300	31.0	164,800	39.9	1,254,800	53.8	11,900	25.5
1895	36,500	30.4	171,800	38.7	1,216,400	52.4	11,500	26.7
1896	38,000	31.4	173,400	42.3	1,193,600	49.9	13,700	25.5
1897	47,200	28.7	170,700	35.4	1,175,100	48.4	13,100	21.7
1898	52,800	35.2	158,200	44.0	1,165,400	56.1	12,400	25.5
1899	51,900	33.4	169,700	41.8	1,135,500	55.2	12,100	25.7
1900	53,800	31.3	174,200	37.3	1,105,000	55.5	11,400	25.7
1901	42,900	34.2	161,700	42.1	1,099,300	56.6	11,000	27.3
1902	44,200	36.2	167,900	49.3	1,082,100	60.6	9,600	28.1
1903	37,600	31.3	158,800	38.3	1,097,500	53.6	10,000	26.9
1904	30,800	33.7	158,100	34.7	1,078,800	55.8	9,400	26.0
1905	37,900	37.8	154,600	46.4	1,066,800	56.9	10,200	27.0
1906	43,900	34.8	176,500	40.9	1,076,300	58.3	10,300	27.6

The records given for Ireland are complete from 1883 to 1906, twenty-four years. They show a material decrease in acreage for wheat, a slight decrease for oats, and a fairly constant acreage for barley and rye. There is no indication of a decline in productivity.

The largest average yield of wheat per acre for any one year of the countries above-named for the period reported on by the Bureau of Statistics is as follows:

Largest average yield of wheat in different European countries in any year covered by reliable statistics.

	Bushels.		Bushels.
Russia	11.4	Switzerland	25.9
Spain	14.9	Sweden	28.0
Italy	15.4	Germany	30.3
Servia	19.4	Netherlands	33.7
Austria	20.2	Belgium	35.1
Hungary	21.8	Great Britain	35.8
France	22.7	Ireland	37.8
Roumania	22.8	Denmark	44.7

The largest average yield of wheat for any one year in several groups of States in the United States for forty years, as compiled from the Bureau of Statistics' records, is as follows:

Largest wheat yield in any year for forty years in several groups of States.

	Bushels.
Virginia, North Carolina, South Carolina, Georgia, and Alabama	11.2
Kentucky and Tennessee	14.3
Texas and Arkansas	15.2
Wisconsin, Michigan, Iowa, and Illinois	16.6
Minnesota, Nebraska, Kansas, and Missouri	16.7
Ohio, West Virginia, and Indiana	17.9
New Jersey, Pennsylvania, Delaware, and Maryland	19.7
California	20.0
Ohio, Indiana, and Illinois	20.2
Oregon	21.1
Maine, New Hampshire, Vermont, and New York	22.4

It is safe to say that the soils of Europe have been occupied for agricultural purposes for one thousand to two thousand years longer than those of the United States, yet during the past twenty-five years ten out of the sixteen countries of Europe reported upon have produced more wheat per acre than any of the groups of States in the United States during the past forty years.

A careful examination of all the available data regarding crop yields in the European countries, and a comparison of these with the yields of the newer lands of the United States, fails entirely to justify the conclusion or general impression that the productivity of the soils of Europe is decreasing. On the contrary, one would be justified in concluding that with the general increase in education and incentive

the sum of the individual failures at the present time is rather more than counterbalanced by the successes, and on the whole there has been an increase in productivity within historic times.

EVIDENCE PRESENTED BY THE YIELD OF CROPS IN THE UNITED STATES.

The impression is strong and widespread that the productivity of the soils of the United States is decreasing. It is believed that the soils are wearing out through loss of mineral plant food removed by crops. It is believed that in the "early seventies" yields of 50 to 60 bushels of wheat per acre were common over the prairie soils of the Northwest.

Whatever may have been accomplished on individual farms at that time or since or however much we may be impressed with the individual failures which come under our personal observation, a careful study of the official records of the Bureau of Statistics of the Department of Agriculture[a] fails entirely to bear out the general impression that the yields are declining in the United States as a whole or in any considerable portion of the area, and gives us a very different and much more modest impression of the average yields obtained in the "early seventies."

In 1885, about twenty-four years ago, Prof. I. P. Roberts, of Cornell University, made inquiry of the Department of Agriculture regarding this question of wheat yield and the statistician, J. R. Dodge, sent him the following statement:[b]

In response to your inquiries I may give a few facts tending to show the increase of rate of yield of wheat, the principal food-grain of countries of high civilization, as the result of progressive and scientific agriculture. It is a very significant fact that the countries of high natural fertility of virgin soils show the lowest rates of yield, while the soils of countries, long cultivated under systematic and enlightened methods, give much higher returns. Thus in Australasia the rate of yield is about 12 bushels per acre, as in this country. In India the average is about 9 bushels.

Coming to Europe, the average of Russia may be said to be 6 to 7 bushels, produced by careless cultivation in the rich soils of the black-earth belt and in other sections. The average of the valley of the Danube differs little from the average yield of this country. The average of Portugal is usually placed at about 13 bushels.

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[a] See the following bulletins of the Bureau of Statistics, U. S. Department of Agriculture:

Bul. 56, Corn Crops of the United States, 1866–1906.
Bul. 57, Wheat Crops of the United States, 1866–1906.
Bul. 58, Oat Crops of the United States, 1866–1906.
Bul. 59, Barley Crops of the United States, 1866–1906.
Bul. 60, Rye Crops of the United States, 1866–1906.
Bul. 61, Buckwheat Crops of the United States, 1866–1906.
Bul. 62, Potato Crops of the United States, 1866–1906.
Bul. 63, Hay Crops of the United States, 1866–1906.

[b] Report of the Commissioner of Agriculture for 1885, p. 375.

In 1873, when a series of good wheat seasons had been enjoyed in Europe, an international statistical commission[a] fixed upon the following average rates of yield for those countries of Europe that furnished statistical data to determine them:

	Bushels.		Bushels.
Great Britain	29.9	Saxe-Weimar	17.2
Saxe-Altenburg	28.7	France	17.1
Belgium	27.9	Baden	16.9
Saxony	27.0	Wurtemberg	16.6
Holland	24.8	Roumania	13.8
Norway	23.3	Portugal	13.2
Denmark	19.5	Hungary	12.6
Finland	17.8		

In the thirteenth century, according to J. E. Thorold Rogers, the rate of yield, while variable and not accurately determined, was not thought to exceed a quarter of 8 bushels. Arthur Young, in 1770, made the average in England 23 bushels per acre, and Sir James Caird, in 1850, 26½ bushels. Though the yield is given in the above table of the commission at 29.9 bushels, Sir James Caird, in 1868, thought 28 bushels near the real average. There was a large yield for several years afterwards, but after 1873 there was a period of low yield, scarcely equal to the average of Ireland, 24 bushels.

In France, according to Alexander Moreau de Jonnes, in his *Statistique de l'Agriculture of France*, the average yield was 8 hectoliters per hectare, or a little more than 9 bushels per acre. In 1873, over 11 bushels; in 1840, 14 bushels. It may be assumed that the yield per acre in France is now very nearly double the rate two hundred years ago. It is not much over a half a century since the average rate of France passed the present yield in this country.

Evidence from Russia is not very explicit, though its tenor is favorable to gradual increase of rate of yield. It has conditions much like our own, large areas of new and cheap lands, which tend to prevent rapid change of rate, while the elements of improvement are in active movement locally. As to this country, the average has not materially increased for the whole area, because that area is geographically changing. It is shifting from east to west and to northwest, taking in fresh prairie lands and giving up to grass and other crops a part of the more eastern acreage. Yet, on the whole, it is not so much abandonment of older areas as the taking up of western lands in the increase of breadth. This change perpetuates substantially the original conditions, and keeps the average nearly the same, viz, about 12 bushels per acre for a series of years throughout the entire breadth in wheat.

I find no evidence that the yield is decreasing in this country. In a given field in the spring-wheat region, the rate will increase for a year or two after breaking, then begin to decline, not from soil exhaustion, but from preoccupation of the soil with weeds. Yet there is evidence that the rate of yield is increasing in Western New York, Southern Michigan, and the wheat counties of Ohio, Indiana, and Illinois, and in Maryland, where some semblance of rotation exists and cultivation has some pretense of a scientific basis. In those regions the average is already about the same as in France, and is 20 to 50 per cent higher than the general average. In 1879 the areas above mentioned averaged about 18 bushels per acre, while spring wheat, grown year after year amid weeds and without any real cultivation of the soil, only produced 11 bushels per acre.

[a] A summary of the results of the International Statistical Congress held at St. Petersburg in 1872 is contained in the Report of the Commissioner of Agriculture, p. 254, 1876.

Again, in 1886, Dodge makes the following statement:[a]

It is sometimes assumed that the yield of wheat is declining in this country. This conclusion is not warranted by the facts. The average for six years past is 12.1 bushels per acre, ranging from 10.4 to 13.6 annually. The average of the preceding ten years was 12.4. Almost any period of five to eight years has heretofore made an average very slightly exceeding 12 bushels. The older wheat-growing States make larger averages than the newly settled regions, not because the land is richer, but because it is more thoroughly cultivated. In the future, as rotation and thorough culture prevail, the average rate of yield must be expected to increase, as it has done in some sections already.

With the complete records of the Bureau of Statistics extending over forty years we should be in a better position to draw conclusions than was Dodge, with less than half the records. Nevertheless it is extremely difficult to draw positive conclusions from estimates, even with records extending over a period of forty years, in a country which has been rapidly developing and when the basis of the estimates, namely, the area is rapidly increasing and where the seasonal variations are large. It may not be safe to assume, as may be done with the European records, that the sum of individual failures at present is rather more than counterbalanced by the sum of individual successes as compared with the past, and to say that there is an indication of increased productivity, since the agricultural history of this country is not old enough nor is the period covered by statistics long enough to justify such a positive statement. The records are, however, sufficient for the statement that there is no evidence to prove a decrease in productivity.

THE YIELD PER ACRE OF WHEAT IN THE UNITED STATES.

The average yield of wheat in the United States for the past forty years from 1867 to 1906 is, according to the records of the Bureau of Statistics, 12.7 bushels per acre.

The following table gives the yields for each year in the several decades:

Average yield per acre of wheat in the United States from 1867 to 1906, by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
11.6	13.9	12.1	13.4
12.1	13.1	11.1	15.3
13.6	13.8	12.9	12.3
12.4	13.1	11.1	12.3
11.6	10.2	15.3	15.0
11.9	13.6	13.4	14.5
12.7	11.6	11.4	12.9
12.3	13.0	13.2	12.5
11.1	10.4	13.7	14.5
10.5	12.4	12.4	15.5
12.0	12.5	12.7	13.8

[a] Report of the Commissioner of Agriculture for 1886, p. 373.

The straight or unweighted averages for the several decades, 12.0, 12.5, 12.7, 13.8, indicate a gradual and regular increase in productivity. However, when these figures are platted and a medial line drawn through the figure, there is indicated a slight downward curve with the low point of the curve about 1886–87, the end and beginning of a decade, which accounts for it not being shown in the averages.

A corresponding depression is noticed in the records for nearly all the States and indicates very strongly a general seasonal influence over most of the country during the middle of the forty-year period. In fact, a critical examination of all the data presented in this bulletin indicates that a full forty-year period is the smallest unit which should be taken to minimize seasonal fluctuations in order to give a normal average which can safely be used as a basis for comparison of relative productivity. Certainly ten-year and even twenty-year averages can not be used with perfect assurance.

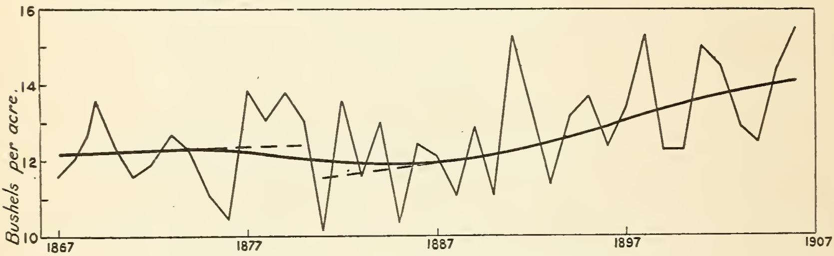

FIG. 1.—Average yield of wheat in the United States from 1867 to 1906.

So far as the available data can be relied upon for any conclusion, it may be said that there is on the whole a decided tendency toward increased productivity of the soils of the United States.

We must, however, see if this has been influenced to any significant degree by the extension of wheat growing into new areas, as the mean acreage of wheat in the United States for the several decades is given as 21,661,078, 35,060,189, 36,583,809, and 45,540,593. There are 33 States which have a higher average yield per acre than the United States as a whole, and 15 States having a lower yield. If proportionately more of the increase in acreage has occurred in the 33 States having above the average yield of the country as a whole, the increase in yield per acre in the United States would be accounted for. To determine this, we must take up the records of the individual States or groups of States having somewhat similar yields and similar increases or decreases in acreage.

In the following table the States for which the Bureau of Statistics has full forty-year records (except California, which has records extending for only thirty-nine years) are arranged in the order of the average yield per acre of wheat over this period:

Average yield of wheat in bushels per acre in different States for forty years, 1867 to 1906.

	Bushels.		Bushels.
Vermont	18.5	California	12.9
Maine	16.5	*Average for United States*	12.7
New York	15.7	Iowa	12.4
New Jersey	14.5	Missouri	12.2
Michigan	14.5	Texas	11.5
Pennsylvania	14.2	West Virginia	10.6
Ohio	14.1	Kentucky	10.5
Kansas	13.9	Virginia	9.1
Wisconsin	13.7	Arkansas	8.9
Minnesota	13.6	Tennessee	8.2
Maryland	13.3	Mississippi	8.1
Illinois	13.2	Alabama	7.6
Nebraska	13.1	Georgia	7.1
Indiana	13.1	North Carolina	6.9
Delaware	13.1	South Carolina	6.6

The most obvious fact brought out by this table is that the arrangement shows roughly three geographical groups of States, the Southern States having very small yields, the New England States with New York showing the largest yields (two or three times as large as the Southern States), and the great wheat States of the Middle West coming between.

The average yield for each of the four decades from 1867 to 1906 is given for each of the States in the table prepared by the Bureau of Statistics and published in the Crop Reporter for December, 1908. These show a general tendency to increase, but there are fluctuations which make it difficult to draw satisfactory conclusions, since the seasonal variations have not been entirely eliminated even over so long a period, and we know that great changes have occurred in the acreage of certain of the States; it is important to see the effect, if any, of these changes upon the average yield.

For the present purpose it has been deemed best to group the States with due regard to equality of yield per acre and increase or decrease in acreage in order to further minimize the influence of seasonal variation of climate.

In considering the change in the productive capacity as measured by the yield per acre of crops, it is necessary to have records covering a sufficiently long period to reduce the seasonal variations to a very small amount, but it is unfortunate that we have available no continuous records in this country for more than forty years, either for a State or for any individual farm or constant area of any soil type.

The nearest approach to this constant acreage and uniformity of yield in several States, where, at the same time, records of the Bureau of Statistics are available for forty consecutive years, is in what may be taken as two groups of States, namely, Maine, New

Hampshire, Vermont, and New York; and New Jersey, Pennsylvania, Delaware and Maryland. In all of these States agriculture is old and in the past forty years there has been relatively very little new land to take up.

Average yield per acre of wheat in Maine, New Hampshire, Vermont, and New York, from 1867 to 1906, by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
13.3	17.0	13.2	17.7
13.1	16.0	15.0	20.6
16.7	14.5	15.0	20.1
15.0	14.3	15.1	19.3
15.5	15.3	16.7	18.6
15.3	14.6	16.6	20.3
13.9	14.2	15.6	21.4
15.9	15.8	19.7	19.9
14.1	15.6	21.4	20.9
14.2	16.2	20.9	22.4
14.7	15.4	16.9	20.1

In Maine and Vermont the acreage in wheat, at all times small, has been reduced considerably in later years, and the yield per acre has materially increased during the successive decades. It may be argued that this increase in yield per acre is due to the abandonment of lands less well adapted to wheat; but in New York, which has a very much larger acreage, but with much smaller change in acreage, the yield has increased nearly as much. If we take the figures representing the yield per acre for each of the States for the four decades as an indication only of productivity and, regardless of acreage, add them together, we get a factor of relative productivity for the different decades in which the seasonal fluctuations will be more nearly eliminated than if we had used the weighted averages, and while the results show the same order of increase we get a smoother curve.

Reducing these sums to figures approximately equal to the average yield per acre of the several States, by dividing by the number of years, the relative yields of the several decades are represented by the figures 14.7, 15.4, 16.9, and 20.1, indicating a decided and progressive increase in the productivity of the lands.

These States, however, show a remarkable falling off in the total land values and contain many so-called "abandoned" farms, but so far as the production of wheat is concerned this is not due to a decline in fertility or to the wearing out of the soil; the explanation must be sought in changed economic conditions connected with the relative cost of production and other conditions which are outside of the scope of this discussion.

The accompanying diagram shows even more clearly than the average figures for the decades the rate of increase in productivity.

The effect of the intelligent reduction of acreage mentioned as a possible factor in increasing the yield per acre of wheat in the New England States and New York can not hold with the second group of States above mentioned, as the acreage has varied but little in the States of New Jersey, Pennsylvania, Delaware, and Maryland. Nevertheless, by combining the yields per acre as productivity factors for these States, as was done with the first group, the relative order of productivity for the different decades is represented by the figures 12.7, 12.9, 13.5, and 16.1, again showing a regular increase for a group of some of the older States, where the land has practically all been settled for much longer than the forty years covered by the data.

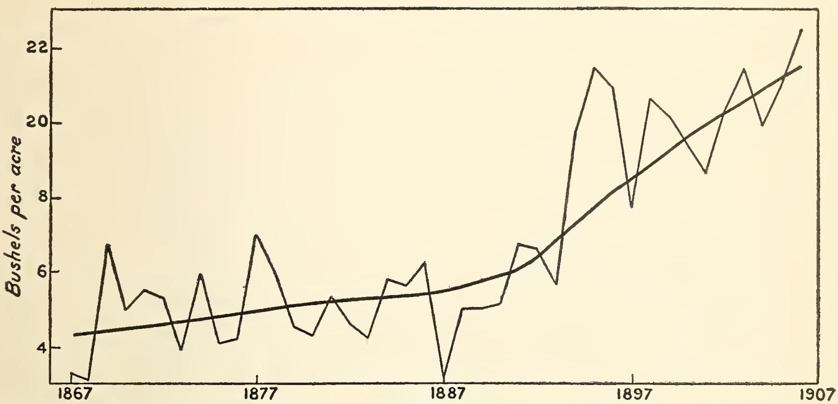

FIG. 2.—Average yield of wheat in Maine, New Hampshire, Vermont, and New York from 1867 to 1906.

Average yield per acre of wheat in New Jersey, Pennsylvania, Delaware, and Maryland, from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
11.7	13.5	10.0	19.7
12.2	14.0	13.1	15.9
14.2	13.8	11.9	13.8
11.1	15.0	11.4	18.1
14.4	11.8	14.7	17.4
10.5	13.4	13.8	15.8
13.2	12.3	14.2	13.1
13.0	12.5	14.7	13.9
12.6	9.9	14.4	15.9
13.8	13.3	16.1	17.0
12.7	12.9	13.5	16.1

The accompanying diagram brings out one detail which is not clearly apparent in the table of figures or in the averages for the

decades, namely, that in the latter part of the second decade and the first part of the third decade there was a marked decline in productivity, evidently due to seasonal influences.

The general trend of the curve is undoubtedly upward. In considering the estimates of the Department of Agriculture it must be remembered that as soon as the actual figures are available from each decennial census the estimates of the bureau on the acreage and yield are adjusted to meet the ascertained facts, and this may have an influence on the estimates of the yield per acre. It is significant that this departure from the general trend of the curve begins at 1881 and ends at 1891, when the census figures were available. It will be seen in considering the yield of corn that this factor has undoubtedly influenced the estimates to a notable extent, espe-

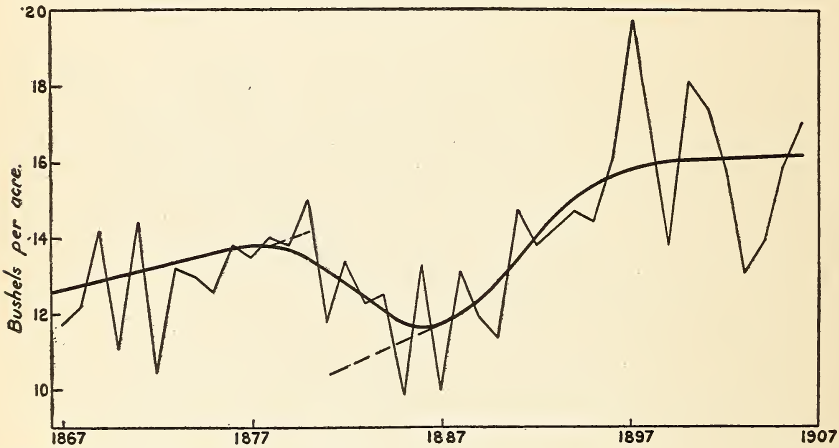

FIG. 3.—Average yield of wheat in New Jersey, Pennsylvania, Delaware, and Maryland from 1867 to 1906.

cially for some of the States. It is of course apparent that this method of diagrammatical representation is a very rigorous expression of estimates, and brings out inequalities which might not be brought out by a similar diagram of ascertained facts, if such facts could be established each year, as is done each decennial year by the Census Bureau. Such definiteness is not possible under the methods which must be employed by the department, nor is it claimed for these estimates. Anyone at all familiar with statistical work will clearly understand these limitations.

In the States of Virginia, North Carolina, South Carolina, Georgia, and Alabama the average yields per acre have been closely comparable and the acreage not very different either among the States or during the period of forty years. The averages are not so regular as in the last two groups of States, in that the figure representing

the average for the second decade is six-tenths of a bushel lower than the first, and for the third decade five-tenths of a bushel less than for the first decade.

Average yield per acre of wheat in Virginia, North Carolina, South Carolina, Georgia, and Alabama, from 1867 to 1906, by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
7.4	9.0	6.8	9.6
6.3	6.7	5.8	11.2
8.1	8.4	6.8	7.2
8.3	6.5	4.8	9.8
6.1	6.7	7.4	9.1
8.2	7.5	7.3	5.7
6.7	6.1	8.2	7.1
7.7	6.5	7.1	9.2
7.7	5.1	7.3	8.1
7.3	5.8	7.9	10.4
7.4	6.8	6.9	8.7

The medial line of the diagram shows a depression. Whether this is real or is influenced in any way by a readjustment to conform to

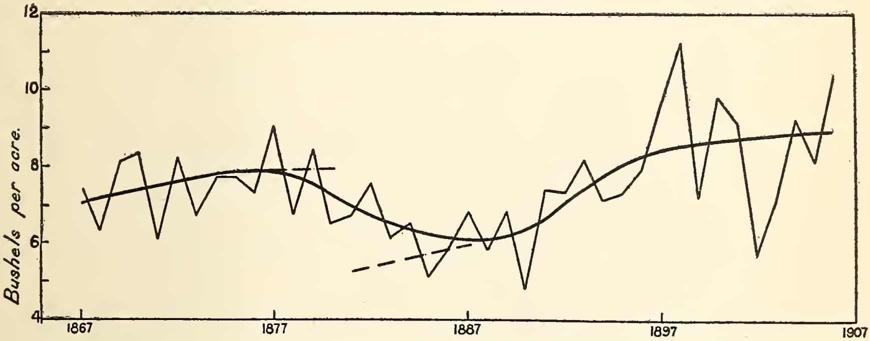

FIG. 4.—Average yield of wheat in Virginia, North Carolina, South Carolina, Georgia, and Alabama from 1867 to 1906.

the facts established by the census of 1880, the figures for which are known to have been available in 1881, and by the census figures of 1890, can not now be established with any certainty. In any event the general trend of the line is upward rather than downward as popularly supposed.

Ohio, Indiana, and Illinois form another group of States having nearly the same acreage and the same yields per acre in which the yield per acre for the past forty years has apparently at least held its own or even increased, the relative productivity of the three States for the four decades being represented by the figures 11.9, 14.2, 13.8, and 13.9.

Average yield per acre of wheat in Ohio, Indiana, and Illinois, from 1867 to 1906, by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
11.2	15.3	13.9	12.6
11.9	15.9	11.6	14.5
13.7	19.5	15.1	11.3
12.3	17.0	11.2	8.1
12.5	10.8	17.7	16.2
12.1	16.4	14.8	17.0
12.2	10.1	13.4	10.7
12.9	13.1	18.5	11.5
9.7	9.8	11.2	17.1
10.7	14.5	10.9	20.2
11.9	14.2	13.8	13.9

Two areas of slight depression are shown in the medial curve of the diagram, but as a whole the line shows a tendency to rise.

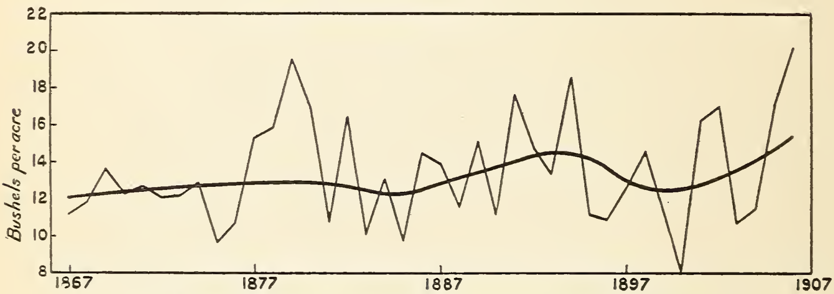

FIG. 5.—Average yield of wheat in Ohio, Indiana, and Illinois from 1867 to 1906.

We now come to two groups of States showing some marked differences in acreage in the last forty years.

The acreage in wheat in the first of these groups, embracing Wisconsin, Michigan, Iowa, and Illinois[a] has declined considerably. The total average acreage in wheat for the four decades is 7,336,041, 8,525,988, 5,697,582, and 4,572,012. The relative yield per acre of the group of States for the corresponding decades may be expressed by the figures 12.4, 13.3, 13.8, and 14.3, as shown by the following table:

[a] The object in averaging the yields of several States being to decrease the seasonal variation and acreage variation, it has been deemed best to use the data for Illinois in two groups, since this State may be classed geographically with Ohio and Indiana, and with Iowa, Wisconsin, and Michigan. Similarly, the data for a State has been used below in more than one group of States, as desired, to secure as wide a basis for the averages as is possible.

Average yield per acre of wheat in Wisconsin, Michigan, Illinois, and Iowa, from 1867 to 1906, by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
12.2	15.9	12.2	12.0
12.9	13.4	12.4	16.6
13.7	15.2	14.5	11.7
13.0	13.4	11.7	12.9
12.3	9.3	16.4	15.3
12.7	14.7	13.5	16.6
13.8	11.9	12.4	13.0
12.2	13.5	16.3	12.7
11.9	12.7	14.8	16.3
9.1	13.4	14.2	16.2
12.4	13.3	13.8	14.3

This shows an apparently regular increase in productivity and by referring to the diagram it is seen that with one slight depression the direction of the medial line is upward, indicating an increasing productivity. It may be argued, as in the case of the New England

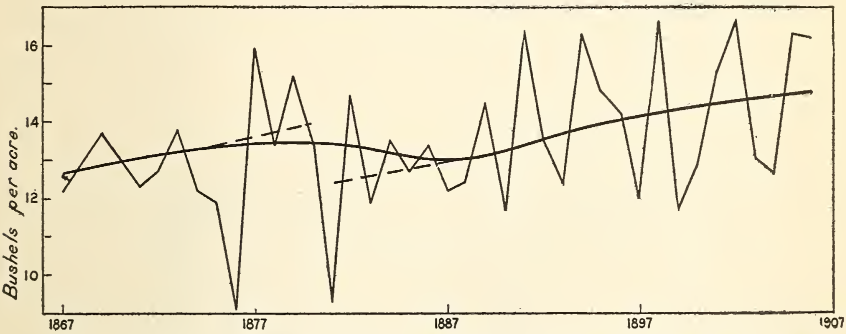

FIG. 6.—Average yield of wheat in Wisconsin, Michigan, Illinois, and Iowa from 1867 to 1906.

States, that in restricting the acreage the lands less well adapted to wheat have been first abandoned and the average yield increased in this way, but this is negatived by a similar increase in productivity in groups of States where the acreage has remained constant or has increased.

We have another group of closely adjacent States, namely, Minnesota, Nebraska, Kansas, and Missouri, where the acreage has largely increased the sum of the mean acreage for the several decades, being 2,693,576, 7,799,182, 8,654,331, and 14,364,930. The relative yield per acre of the group may be expressed by the figures 13.8, 12.6, 12.6, and 14, showing an apparent increase. The figures for Minnesota and Kansas, it is true, appear to show a slight decrease, but the seasonal variations in both these States are large, so large they are not eliminated in the ten-year periods. For example, in Nebraska in the first and third decades the difference between the highest and lowest yield is actually greater than the average yield for forty years. The

larger the group of States that can be compared, other things being equal, the better.

Average yield per acre of wheat in Minnesota, Nebraska, Kansas, and Missouri, from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
13.5	15.3	11.9	13.0
15.0	13.1	11.4	14.1
16.7	12.2	14.5	10.9
14.4	11.3	11.9	13.2
12.7	9.1	15.4	16.1
12.3	13.9	13.5	16.3
15.2	14.0	9.1	12.9
13.1	14.5	11.6	12.6
13.2	10.1	13.7	14.8
11.7	12.4	12.6	15.7
13.8	12.6	12.6	14.0

The accompanying diagram shows the medial line describing one great uniform curve with the points of origin and ending approxi-

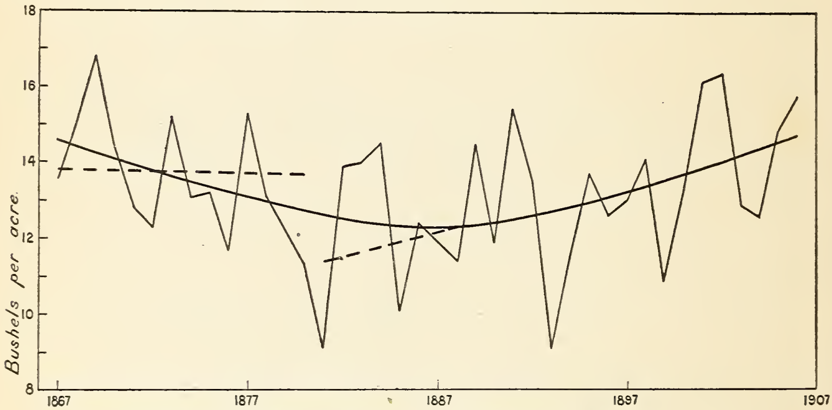

FIG. 7.—Average yield of wheat in Minnesota, Nebraska, Kansas, and Missouri from 1867 to 1906.

mately at the same elevation. Some doubt is cast upon the validity of this curve on account of the uncertainty as to what influence, if any, the census figures available in 1881 had upon the basis of estimating the yields for the decade ending with the publication of the figures for the 1890 census. If an adjustment was made so that the medial line need not be continuous the most probable course would be represented by the broken lines. If the continuous curve is followed there is no evidence of permanent decline in productivity. If the broken line is followed there is evidence of a general and continuous increase in productivity.

We are justified in concluding in this group of States where the acreage has increased the productivity has increased, as was shown in the last group of States where the acreage has decreased.

Combining the data for all eight of the States just named—Wisconsin, Michigan, Iowa, Illinois, Minnesota, Nebraska, Kansas, and Missouri—we get for the average figures for the four decades 13.1, 13, 13.2, and 14.1.

Average yield per acre of wheat in Wisconsin, Michigan, Iowa, Illinois, Minnesota, Nebraska, Kansas, and Missouri, from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
12.8	15.6	12.0	12.6
14.0	13.3	11.9	15.3
15.2	13.7	14.5	11.3
13.7	12.3	11.8	13.1
12.5	9.2	15.9	15.7
12.5	14.3	13.5	16.4
14.5	13.0	10.7	12.9
12.6	14.0	13.9	12.7
12.6	11.4	14.2	15.5
10.4	12.9	13.4	15.9
13.1	13.0	13.2	14.1

In the diagram we can only show the medial line as making one long curve sloping gently downward from the origin during half the

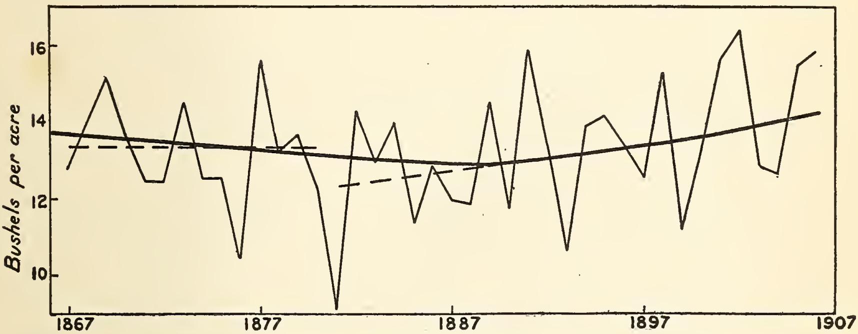

FIG. 8.—Average yield of wheat in Wisconsin, Michigan, Iowa, Illinois, Minnesota, Nebraska, Kansas, and Missouri from 1867 to 1906.

period, and then upward to the end point, which is somewhat higher than the origin, as though the seasonal changes had passed through a single cycle of forty years. If there was an adjustment of the department's estimates in 1881 to conform with the data of the Tenth Census, then it would have shown a broken line, each section rising slightly from the two points of origin.

Kentucky and Tennessee have each maintained a fairly constant acreage for the forty-year period. The figures representing the average yield by decades, 8.8, 8.1, 9.7, 10.9, indicate a gradual increase save for a slight decrease in the second decade. The diagram shows this to be due to a slight depression originating at the same period as in several of the other groups of States.

Average yield per acre of wheat in Kentucky and Tennessee from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
8.4	10.5	9.1	12.4
7.6	7.2	9.4	14.3
9.7	11.0	9.3	8.9
9.4	7.4	8.2	11.5
5.6	6.8	11.2	11.5
10.8	10.7	10.7	8.3
8.1	6.7	10.3	7.8
9.8	8.8	10.3	11.5
9.3	3.4	9.9	9.3
9.2	8.9	8.6	13.3
8.8	8.1	9.7	10.9

On the whole there can be no doubt that the productivity has shown a decided tendency to increase in this group of States.

FIG. 9.—Average yield of wheat in Kentucky and Tennessee from 1867 to 1906.

With Ohio, West Virginia, and Indiana we have a group of States where the acreage showed a decided increase during the first three decades. The total acreage in wheat for the four decades is 3,503,127, 5,283,871, 5,530,392, and 4,588,086. The figures representing the average yields for the several decades, 11.6, 13.3, 12.4, 13.1, show a tendency toward increased productivity save for a relatively high yield in the second decade.

Average yield per acre of wheat in Ohio, West Virginia, and Indiana, from 1867 to 1906, by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
10.9	13.9	12.0	14.4
11.6	15.2	10.2	15.5
13.9	17.6	13.2	11.1
12.1	15.5	10.5	7.0
12.0	11.5	15.2	14.0
11.5	14.3	13.0	13.6
10.9	10.1	13.4	11.3
12.9	12.8	16.5	10.3
8.4	8.8	11.0	15.9
11.3	13.5	9.4	17.9
11.6	13.3	12.4	13.1

When the results are represented diagrammatically this increase is not so apparent, as the medial line is wavy and shows clearly neither an increase nor a decrease in productivity.

In Texas the acreage has increased about ninefold, comparing the total acreage of the first decade and of the last. In Arkansas the

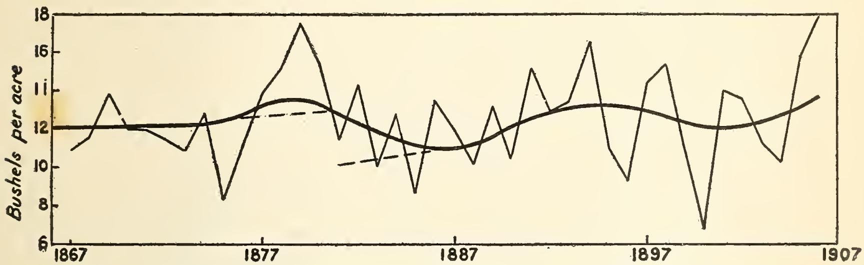

FIG. 10.—Average yield of wheat in Ohio, West Virginia, and Indiana from 1867 to 1906.

acreage has remained fairly constant. Combining the data for the two States the figures representing the average yields of the four decades show the highest yield in the first decade with an increasing yield from the second to the fourth.

Average yield per acre of wheat in Texas and Arkansas, from 1867 to 1906 by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
9.4	10.5	9.9	13.2
9.8	11.0	10.2	12.9
11.5	7.8	9.0	9.9
11.3	7.5	7.1	14.3
9.9	8.9	10.8	8.9
14.5	8.2	10.3	9.1
13.5	7.3	9.3	10.2
11.5	8.8	11.9	10.4
15.2	8.9	7.6	8.4
10.6	9.0	9.9	11.2
11.7	8.8	9.6	10.9

A probable reason for this is shown in the diagram (fig. 11). It was due to three phenomenally high yields in the first decade and probably to an adjustment of the department's estimates in 1881 to conform with the figures of the Tenth Census. If an adjustment was made the curve should be broken, and its true position may be represented by the broken lines on the diagram.

The acreage in wheat in California has been fairly constant for the forty-year period. The figures representing the average yields for the four decades, 14.6, 12.9, 12.7, 11.6, show an apparently regular decrease in productivity, and this State is popularly supposed to represent an extreme case of declining yields in wheat and loss of fertility due to continuous wheat culture.

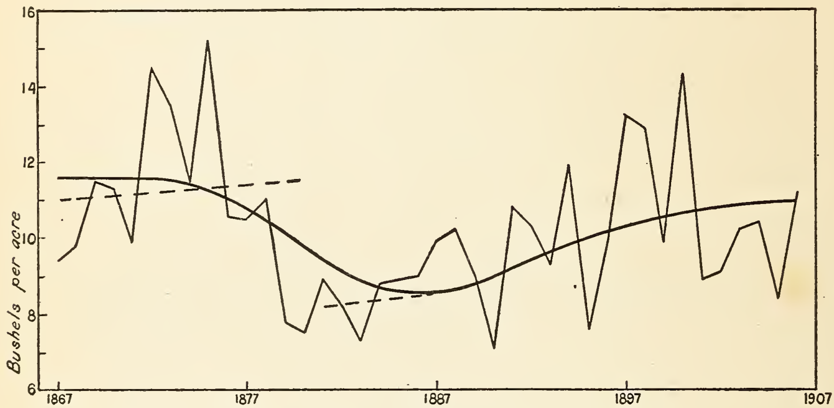

FIG. 11.—Average yield of wheat in Texas and Arkansas from 1867 to 1906.

Average yield per acre of wheat in California from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
....	9.5	11.0	10.0
20.0	17.0	12.1	9.1
18.2	14.0	13.3	14.1
19.0	16.0	12.0	10.3
11.0	12.0	13.0	13.0
12.2	13.0	13.0	10.9
13.5	13.0	13.3	11.2
13.2	13.2	11.3	10.8
11.0	9.4	13.0	9.3
13.0	11.6	14.6	17.1
14.6	12.9	12.7	11.6

When the data are represented diagrammatically, the medial line has a slight tendency downward.

There are three relatively very high yields in the first decade, two in the second, and one in the last year of the last decade; but on the whole practically little change is indicated by the general direction of the line.

The data for Oregon show great fluctuations from year to year. The figures in the table show lower yields in the second and third decades than in the first and last. This is brought out more clearly in the diagram, which seems to show one long, uniform curve showing

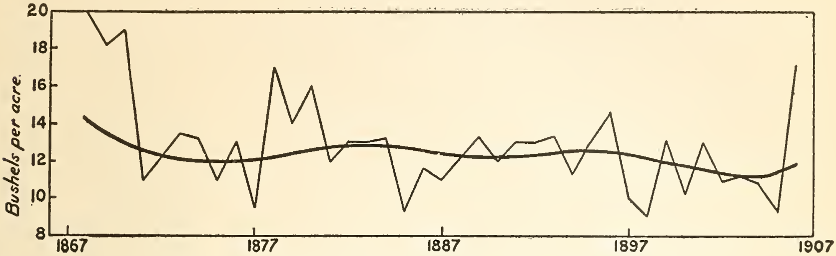

FIG. 12.—Average yield of wheat in California from 1867 to 1906.

a somewhat decided tendency to decrease until about the end of the second decade, and an equally decided increase during the last two decades.

Average yield per acre of wheat in Oregon from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
....	20.0	17.5	17.0
....	21.0	16.3	20.5
19.0	16.0	16.2	19.2
19.5	17.0	14.5	13.8
19.2	17.2	19.0	21.1
18.2	16.7	15.7	20.0
19.0	16.5	17.5	18.2
19.5	18.0	17.7	19.0
17.6	15.9	20.0	18.6
17.0	12.6	17.0	20.0
18.6	17.1	17.1	18.7

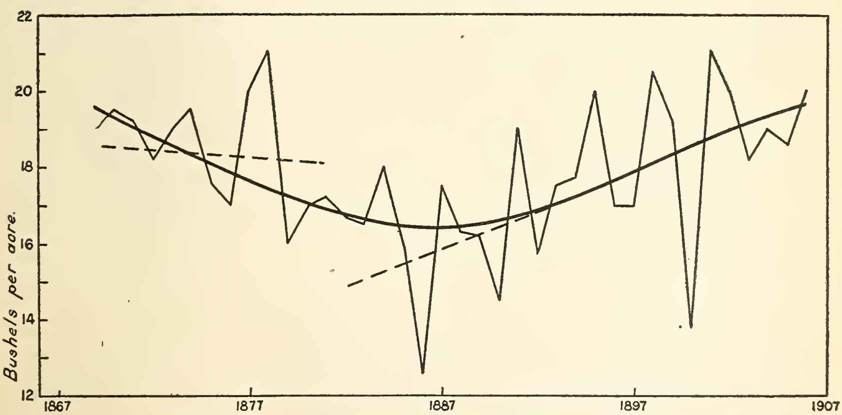

FIG. 13.—Average yield of wheat in Oregon from 1867 to 1906.

The following table gives, in decades, the data for the States having records covering less than forty-year periods and more than twenty

years and with records for not less than five of the years in each decade.

Average yield of wheat, in bushels per acre, in States having records for more than twenty and less than forty years.

State or Territory.	First decade.	Second decade.	Third decade.	Fourth decade.
Utah	....	[a] 17.5	18.8	23.5
Nevada	[b] 21.1	[b] 17.3	19.2	26.0
Wyoming	....	[a] 17.4	[c] 21.0	23.0
Idaho	....	[a] 16.9	19.2	23.8
Colorado	....	[b] 19.2	19.0	24.6
North Dakota	....	[a] 14.1	[c] 14.0	12.3
Montana	....	[a] 17.5	20.8	26.7
New Mexico	....	[a] 13.2	15.6	20.0
Arizona	....	[a] 13.8	16.2	21.8
Washington	....	[a] 16.5	17.7	23.3

[a] Five years. [b] Seven years. [c] Six years.

The data here are so incomplete in comparison with what has been given, and the development of irrigation in many of these States has been so great a factor that the results will not be discussed. For some of the other States, notably Massachusetts, Connecticut, Rhode Island, South Dakota, Louisiana, and Florida, the data are so incomplete that no conclusion can be drawn.

From the foregoing analysis of the statistics that are available it is seen that there is no indication of a general decrease in productivity of our soils when planted to wheat. If any conclusion is to be drawn from the data, it must be that the productivity has increased. This applies equally to States and groups of States where the acreage has remained constant, where it has increased, and where it has decreased. It applies equally to States where commercial fertilizers have been used more or less freely and to States where the use of commercial fertilizers has not yet become general. It applies as well to the older soils of the Eastern and Southern States as to the newer soils of the Western States. The conclusion seems to be inevitable that the upward tendency observable is due to better and more intelligent methods of control. However much we may be impressed by the cases of failures which come to our personal knowledge, in the country as a whole the sum of successes counterbalance the failures rather better at present than in the past.

THE YIELD PER ACRE OF CORN IN THE UNITED STATES.

The average yield per acre of corn in the United States for the past forty years, from 1867 to 1906, as given by the Bureau of Statistics is 25.1 bushels. The figures representing the average yield for the four decades are 26.2, 25.1, 24.1, and 25.4.

Average yield per acre of corn in the United States from 1867 to 1906, by years and by decades.

1867–1876.	1877–1886.	1887–1896.	1897–1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
23.6	26.7	20.1	23.8
26.0	26.9	26.3	24.8
23.6	29.2	27.0	25.3
28.3	27.6	20.7	25.3
29.1	18.6	27.0	16.7
30.8	24.6	23.1	26.8
23.8	22.7	22.5	25.5
20.7	25.8	19.4	26.8
29.5	26.5	26.2	28.8
26.2	22.0	28.2	30.3
26.2	25.1	24.1	25.4

There has been a considerable increase in acreage, the total acreage for the four decades being 386,884,000, 634,089,000, 742,909,000, and 879,712,000. This change in the acreage, one of the factors upon which the average yield per acre is based, must be considered in drawing conclusions from the figures. The following diagram, however, is based on the yields regardless of changes in acreage:

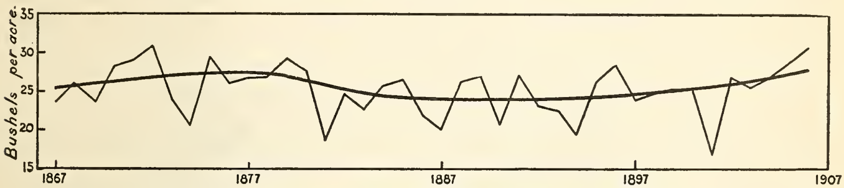

FIG. 14.—Average yield of corn in the United States from 1867 to 1906.

The medial line curves slightly downward during the middle of the period. It is somewhat doubtful if this apparent decrease is real, as there was evidently an adjustment of the department's estimates in 1881 to accord with the figures which were available from the records of the Tenth Census. Such adjustment was undoubtedly made for some of the States, but not for all, as will appear further on, and these adjustments affected the estimates for the United States. Allowing for such an adjustment the medial line of the diagram should be broken at 1880–81 and the two parts would then show a gradual and constant rise from each point of origin. That such an adjustment was made seems altogether likely from the following statement by the statistician of the department:[a]

The abnormal extraordinary increase of recent years made it difficult to keep pace with advancing production, as is shown by the record for 1879, which is widely at variance with the census returns for that year. In other crops the difference is usually slight between the two records, but in the corn estimate it is evident that the department figures are quite too low.

[a] Report of the Commissioner of Agriculture, 1881–82, p. 580.

It seems impossible after the lapse of nearly thirty years to determine with certainty what adjustments were made for the several States at any particular time in a system which from the very nature of its work should be adjusted from time to time as definite figures are established.

In most of the States there has been a decided increase in corn acreage. In only Maine and Rhode Island has there been a decided decrease in acreage. In New Hampshire, Vermont, Massachusetts, Connecticut, New York, Pennsylvania, and New Jersey there has been little change in acreage. In California there was an increase followed by a decrease in the last decade.

The following table gives the percentage of increase in the acreage of the twenty-four States showing a material increase from 1867 to 1906:

Percentage of increase in corn acreage from 1867 to 1906 in the several States where material increase has occurred.

State.	Percentage of increase.	State.	Percentage of increase.	State.	Percentage of increase.
Nebraska	2,500	Missouri	130	Kentucky	56
Kansas	700	*Average for United States*	127	Indiana	54
Texas	356	Michigan	124	Mississippi	50
Minnesota	469	Louisiana	121	Tennessee	49
Arkansas	190	Virginia	87	Alabama	46
Iowa	179	South Carolina	85	Illinois	36
Florida	153	North Carolina	75	Maryland	26
Wisconsin	152	Georgia	72	Ohio	21
West Virginia	133				

The following table gives the States for which forty consecutive years' records are furnished by the Bureau of Statistics (excepting California, which has thirty-nine years' record), arranged according to their average yields per acre:

Average yield of corn, in bushels per acre, for forty years, 1867–1906, by States.

State.	Yield.	State.	Yield.	State.	Yield.
New Hampshire	35.1	Illinois	30.2	Tennessee	22.0
Vermont	35.1	Rhode Island	30.1	Arkansas	20.0
Massachusetts	34.5	California	30.1	Texas	19.1
Pennsylvania	33.2	Minnesota	29.2	Virginia	19.0
New Jersey	33.2	Nebraska	28.7	Louisiana	16.7
Maine	32.9	Missouri	28.3	Mississippi	15.0
Ohio	32.9	Maryland	26.6	North Carolina	13.3
Connecticut	32.2	Kentucky	26.1	Alabama	13.1
Iowa	32.2	West Virginia	25.3	Georgia	11.0
Indiana	31.5	Kansas	25.1	Florida	9.8
Wisconsin	31.3	*Average for United States*	25.1	South Carolina	9.7
New York	30.8	Delaware	22.6		
Michigan	30.8				

There are twenty-three States in which the yield equals or exceeds the average yield of the United States and twelve States having a lower yield.

In looking over the crop records of a State or nation for a period of years one can not help being impressed with the wide fluctuations in yields from year to year, giving the diagram, when the points of observation are connected by straight lines, a saw-tooth appearance. This seems to be due principally to variations in rainfall. This fact is brought out in a striking way for the corn crop by J. Warren Smith, who says: [a]

All cultivators of the soil recognize the important relation between precipitation and crop yield. Johnson [b] said in 1870: "It is a well-recognized fact that next to temperature the water supply is the most influential factor in the production of a crop."

We believe that few people have any proper appreciation of the effect of an abundant water supply upon the ultimate yield of crops, although this subject is now receiving careful investigation. In a recent publication of the Department of Agriculture [c] describing an exhaustive investigation of many types of soils under many conditions of cultivation and wide range of yields it was found impossible to correlate the yields observed with the nutritive mineral elements in the soil or in the soil solution, which latter is the immediate source from which plants feed. From this it was concluded that on the average farm the great controlling factor in the yield (but not necessarily the quality) of crop is not the amount of plant food present, but a physical factor, the exact nature of which is yet to be determined, and this idea is made more definite by the further statement "that the actual quantity of water a soil can furnish the plant, irrespective of the percentage of water actually present in the soil, has probably a very important influence on the yield."

It is self-evident that to have water furnished to the plant in any soil in sufficient quantities there must be an abundant supply available either through actual rainfall or through irrigation; so that, other things being equal, the results of the investigations of the Bureau of Soils seem to agree with the results found in practice, namely, heavy rainfall, large yields; light rainfall, small yields. And not only this, but, in a latitude and elevation favorable for the production of crops, precipitation has first place and temperature the second.

It was with something of this thought in mind that the writer, assisted by Prof. William D. Gibbs, president of New Hampshire State College, began the preparation of the accompanying charts; yet neither was prepared for the remarkable confirmation of their theory or the close relation between the yield of corn and the precipitation in certain definite short periods during the growth of the crop.

* * * Inasmuch as the greater portion of the corn produced in the United States is grown in the central part of the country, only Ohio, Indiana, Illinois, Iowa, Nebraska, Kansas, Missouri, and Kentucky are considered, both in the yield per acre and the precipitation.

As the area of greatest corn production does not include all of Ohio, Kentucky, Kansas, and Nebraska, we probably should have considered only the western parts of Ohio and Kentucky and the eastern parts of Nebraska and Kansas for both yield and rainfall. * * *

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[a] Relation of Precipitation to Yield of Corn, J. Warren Smith, Section Director, Weather Bureau, Yearbook of the Department of Agriculture, p. 215, 1903.

[b] How Crops Feed, p. 216.

[c] Bulletin No. 22, Bureau of Soils, p. 63.

In the following chart the rainfall for June, July, and August is combined in the dotted line, giving the average total rainfall for those months over the eight States. The full line shows the yield.

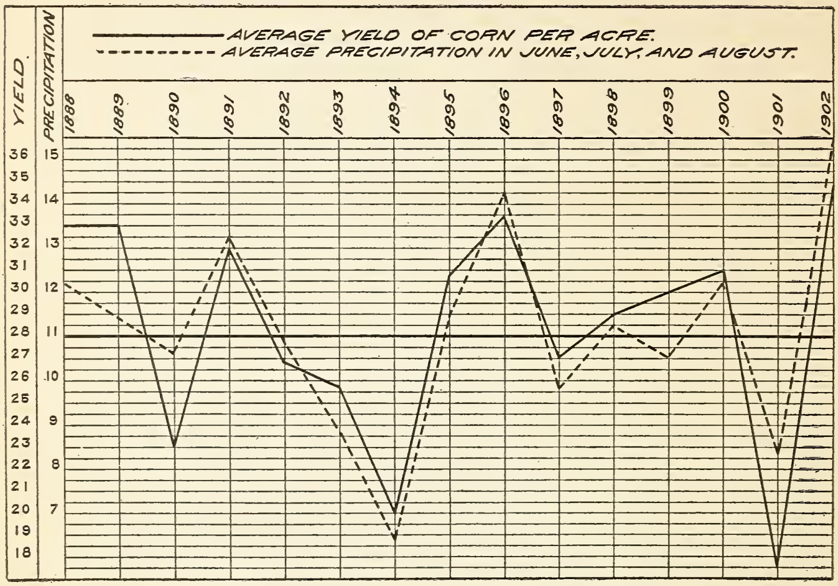

FIG. 15.—Precipitation for June, July, and August, and yield of corn per acre.

It is supposed to take from twenty to thirty years to establish a normal monthly temperature and longer than this to establish a reliable normal for rainfall.[a] As the variation in yield is of the same order as the variation in rainfall, we must not take too seriously slight variations or inequalities in average yields for periods of ten years but rather by generalization attempt to get at the trend of the change rather than at actual amounts of increase or decrease.

Of the six New England States, the acreage in Maine and Rhode Island has materially decreased, while indications are that the yield per acre has slightly increased. The acreage of the four other States has remained fairly constant, while the figures indicate a slight decrease in yield per acre in New Hampshire and Vermont, and a slight increase in Massachusetts and Connecticut. The differences,

[a] A recent publication of the Weather Bureau, entitled "Summary of the Climatological Data for the United States by Sections: Section 1—Southern Texas," pp. 1, 2, contains the following statements:

"The period of observations, 1871 to 1907, inclusive, thirty-seven years, covers a sufficient length of time to warrant the assumption that the variations within which the several climatic elements are liable to fluctuate are embraced therein. * * *

"The tables of temperature, days with rain, average relative humidity, etc., generally cover periods of less duration than the precipitation data, but of sufficient length to construct dependable averages."

however, are so slight, as compared with the fluctuations within the decades that no safe conclusions can be drawn as to any change of productivity. Comparing the groups of States, as was done in the case of wheat, the total acreage for the four decades was 2,469,000, 2,627,000, 2,169,000, and 1,951,000, while the relative yields for the four decades may be expressed by the figures 32.6, 32.5, 34.7, and 34.4, indicating, if anything, a slight increase in productivity of the soils as measured by the yield per acre of corn.

Average yield per acre of corn in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
33.2	35.7	34.4	33.5
33.6	36.2	26.3	39.2
29.8	32.6	34.0	36.1
32.4	33.3	34.8	36.8
31.9	30.2	36.7	38.2
34.3	25.2	36.3	26.3
31.0	33.1	30.1	25.2
30.5	32.7	35.3	35.3
33.1	33.4	40.1	36.4
35.7	33.0	39.1	37.1
32.6	32.5	34.7	34.4

The figures representing the average yields for the several decades appear to fluctuate slightly, but the diagram shows this to be due to

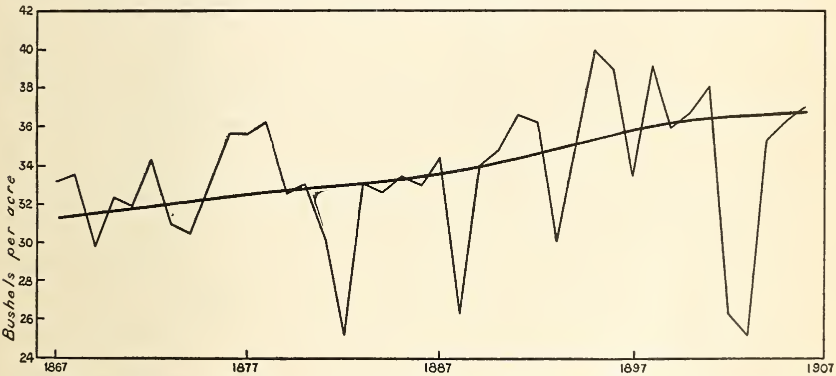

FIG. 16.—Average yield of corn in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut from 1867 to 1906.

four or five exceptionally low yields, while the medial line shows an upward trend during the forty years for this group of States.

The acreage in New York, Pennsylvania, and New Jersey has varied but little in the forty years. The figures representing the average yield for the several decades—34.3, 31.4, 31.5, 33.2—indicate neither an increase nor a decrease in productivity.

Average yield per acre of corn in New York, New Jersey, and Pennsylvania from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
31.8	33.8	31.7	32.8
34.8	35.7	32.4	35.7
29.8	34.0	29.8	34.0
34.3	38.8	28.4	30.0
34.8	24.9	33.1	35.0
38.7	29.2	31.7	31.9
34.0	26.0	26.6	26.7
32.7	31.0	31.1	33.1
38.3	31.7	34.0	35.4
33.7	28.9	35.7	37.1
34.3	31.4	31.5	33.2

When the data is charted, however, it is seen that there is a decided break at the years 1880-81 when the census figures were available, and the only possible explanation is that the department's

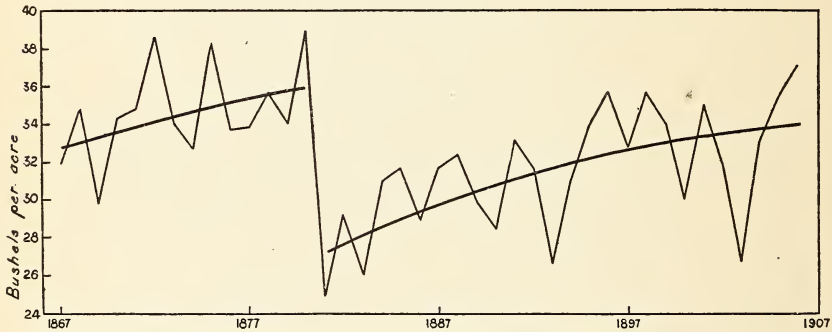

FIG. 17.—Average yield of corn in New York, New Jersey, and Pennsylvania from 1867 to 1906.

estimates were adjusted at that time in conformity with the facts determined by the census. The medial line of the diagram is seen to rise gradually but steadily from the two points of origin, indicating a gradual increase rather than decrease in productivity of the soils of these States, as was shown in the last group of States.

The acreage in corn in Maryland, Delaware, and Virginia has materially increased, the total acreage for the several decades being 16,145,000, 24,973,000, 28,038,000, and 26,243,000. The figures representing the average yield per acre—22.2, 21.3, 21, 27.1—show nothing definite regarding a change in productivity.

Average yield per acre of corn in Maryland, Delaware, and Virginia from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
21.9	23.2	21.5	26.7
24.0	22.0	19.1	26.0
17.9	25.5	18.0	24.7
22.5	29.7	19.5	22.0
22.7	17.9	22.4	28.8
21.3	21.3	18.2	27.5
19.8	18.5	22.6	26.0
19.5	18.5	21.3	29.0
26.0	18.7	22.1	30.2
26.3	17.7	25.2	29.8
22.2	21.3	21.0	27.1

The diagram, however, shows a very decided break at the period 1880–81, which is undoubtedly due, as in the case of the last group of States, to a readjustment of the department's estimates to accord with

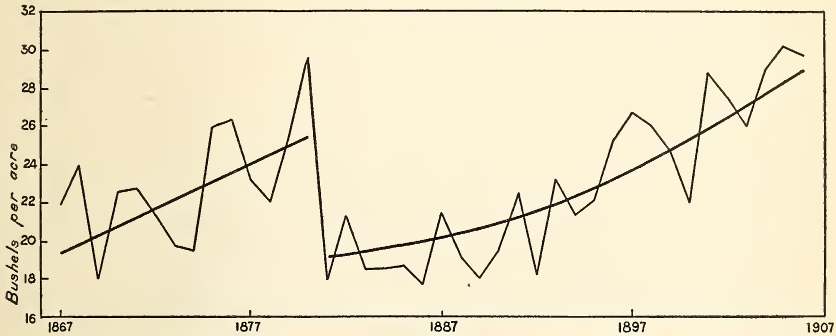

FIG. 18.—Average yield of corn in Maryland, Delaware, and Virginia from 1867 to 1906.

the findings of the Tenth Census. The two sections of the medial line each show a decided rise from the point of origin, indicating a decided increase in productivity for this group of States for the forty-year period.

The total acreage in corn for the several decades for the group of States embracing North Carolina, South Carolina, Georgia, Florida, and Alabama, 66,993,000, 86,117,000, 102,619,000, 113,809,000, show a decided increase. The figures representing the average yield for the several decades, 12.2, 10.8, 11.4, 11.3, give little indication of a change in productivity.

Average yield per acre of corn in North Carolina, South Carolina, Georgia, Florida, and Alabama, from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
12.4	11.7	11.7	10.6
11.7	11.0	10.3	11.4
12.7	10.6	11.8	10.8
13.0	11.3	10.7	9.6
11.9	9.1	12.3	9.7
13.2	12.5	10.6	10.0
12.2	9.6	10.4	12.3
12.3	11.0	12.0	13.0
11.5	10.5	13.1	12.1
11.3	10.6	10.9	13.3
12.2	10.8	11.4	11.3

In this case the diagram brings out nothing more definitely than do the figures, and it is not evident that the productivity has changed materially one way or the other.

The total acreage for the several decades for the group of States embracing Ohio, Indiana, Illinois, Michigan, Wisconsin, and Minne-

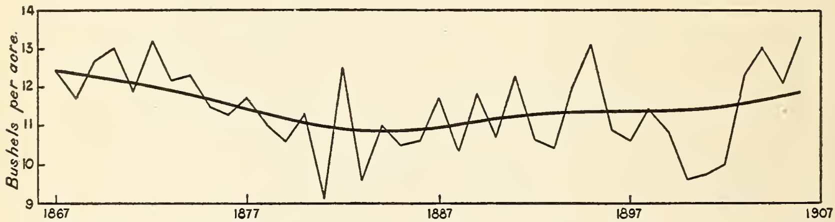

FIG. 19.—Average yield of corn in North Carolina, South Carolina, Georgia, Florida, and Alabama from 1867 to 1906.

sota is 126,441,000, 177,378,000, 162,838,000, and 193,646,000. The figures representing the average yields for the several decades, 31.9, 30.3, 28.9, 33.1, show definitely little as to any change in productivity.

Average yield per acre of corn in Ohio, Indiana, Illinois, Michigan, Wisconsin, and Minnesota from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
29.5	29.8	23.8	30.9
33.6	34.6	32.1	34.0
26.8	35.6	28.2	33.8
36.9	33.7	26.5	36.8
36.6	25.7	30.2	25.9
37.9	29.5	27.3	31.9
29.0	23.9	26.0	31.0
27.8	29.2	24.4	30.9
31.0	32.5	33.3	37.0
30.0	28.8	37.0	38.3
31.9	30.3	28.9	33.1

The diagram shows either a considerable depression in curvation of the medial line with a general trend upward, or, what is more

likely, a readjustment of the department's estimates in 1881, which would give two sections of a nearly straight broken line with a decided upward slope. It is impossible to state at this time which of these two interpretations of the diagram is correct. Each of them, however, shows a marked tendency toward increased productivity; the one more than the other.

The average yield for Nebraska and Kansas for the several decades may be expressed by the figures 33.5, 33.2, 24.5, and 24.9. These two States show by far the greatest increase in corn acreage of any of the 35 States under consideration. The basis for the estimate of the average yield per acre in the last decade—namely, the acreage—was 700 per cent larger in Kansas and 2,500 per cent larger in Nebraska than in the first decade; yet we have in Nebraska the average yield of 32 bushels on 3,011,000 acres in the first decade to compare with the average yield of 27.8 bushels on 77,213,000 acres in the last

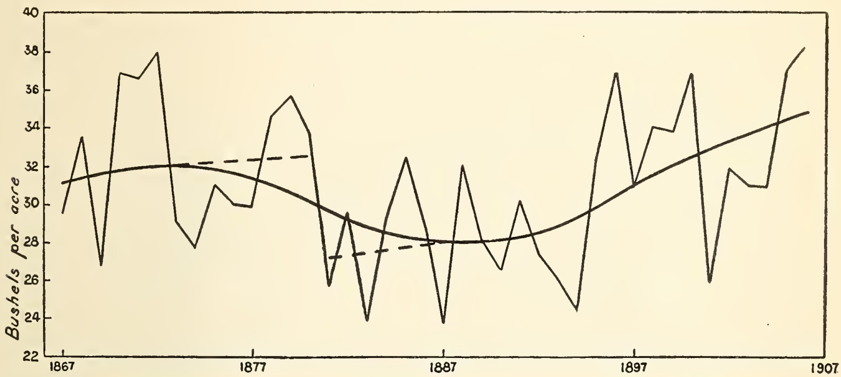

FIG. 20.—Average yield of corn in Ohio, Indiana, Illinois, Michigan, Wisconsin, and Minnesota from 1867 to 1906.

decade and nearly as great a disparity in the case of Kansas. The combined acreage for the four decades is 12,625,000, 63,621,000, 110,130,000, and 154,177,000.

However, taking the original data as they stand, we find, in going back to the records for the individual State, three years of crop failure in Kansas in the third decade, the average yields being for 1887, 14.6 bushels; 1890, 15.6; and 1894, 11.2, the highest yield being in 1889, 35.3 bushels. In the last decade there were three years of very low yields—1897, 18 bushels; 1898, 16; and 1901, 7.8. The last five years of the last decade show four years well above the average for the forty years. Similarly, in the third decade, Nebraska shows a yield of only 6 bushels in 1890, while in the last decade are two very low yields and four out of the last five years show a considerably larger yield than the average for the forty years.

Average yield per acre of corn in Nebraska and Kansas, from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
37.5	37.2	19.3	24.0
20.4	37.9	30.9	18.5
45.3	37.0	35.9	27.5
28.9	30.2	16.8	22.5
40.7	22.8	30.9	10.9
38.1	34.3	26.3	31.1
37.0	36.3	23.2	25.8
10.2	37.3	8.6	26.8
40.0	34.5	20.2	30.2
36.7	24.6	32.7	24.9
33.5	33.2	24.5	24.9

The diagram shows a great depression covering the past twenty years. This may be due in part, but not entirely, to a readjustment of the Department's estimates in 1881. It is probably due in part to

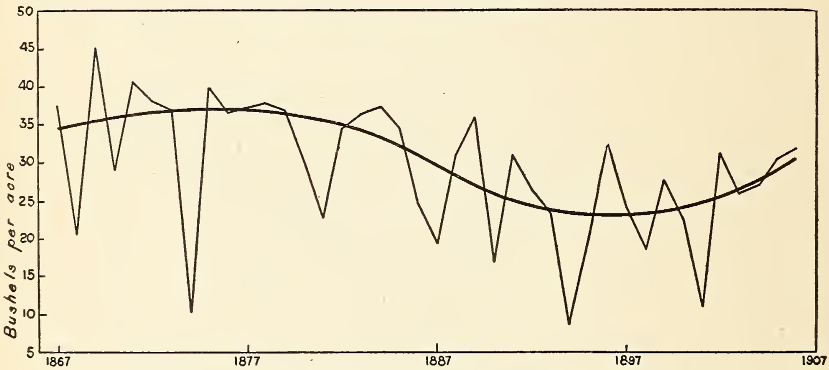

FIG. 21.—Average yield of corn in Kansas and Nebraska from 1867 to 1906.

the westward extension of agriculture into the drier soils of the western parts of these States.

The same general inequalities are shown in the statistics for the other crops reported upon for these two States by the Bureau of Statistics, with the possible exception of wheat, and while the facts can be explained only in part there is nothing that clearly indicates a positive change in productivity.

Adjoining Kansas and Nebraska on the east are the States of Iowa and Missouri, where there has likewise been a considerable increase in acreage, although not so large as in the first-named States. The total acreage of the two States for the four decades is 58,188,000, 117,138,000, 141,778,000, and 148,721,000. The average yields may be expressed by the figures 32, 29.7, 29.8, and 30.2.

Average yield per acre of corn in Iowa and Missouri from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
30.5	30.7	23.7	27.5
33.6	31.8	33.4	30.5
31.9	37.5	35.8	28.5
31.7	33.2	25.9	33.0
40.2	21.1	33.3	17.5
38.4	27.7	28.0	35.5
26.2	25.9	30.9	30.2
22.6	33.7	18.5	29.4
35.8	31.7	35.5	34.3
28.9	23.6	33.0	35.9
32.0	29.7	29.8	30.2

The diagram indicates that there was a slight adjustment of the department's estimates in 1881 as indicated by the broken lines, but assuming that the curve should stand as drawn, in either case there is a tendency toward increased production.

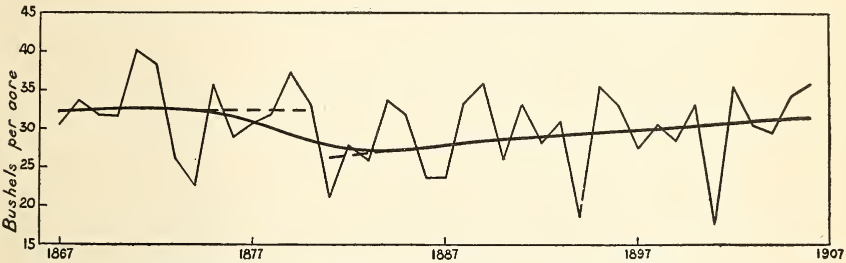

FIG. 22.—Average yield of corn in Iowa and Missouri from 1867 to 1906.

The total acreage in corn for the several decades for Mississippi, Louisiana, Texas, and Arkansas is 40,408,000, 71,225,000, 91,561,000, and 110,791,000. The figures representing the average yields for the several decades are 20.9, 17.5, 16.9, and 17.5.

Average yield per acre of corn in Mississippi, Louisiana, Texas, and Arkansas, from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
21.5	20.0	18.1	16.5
23.7	20.7	17.1	20.3
24.9	17.0	17.7	18.0
24.3	20.9	15.2	16.3
18.5	12.7	18.3	11.1
21.2	19.1	16.9	13.4
18.6	15.7	15.3	21.0
15.2	15.2	17.9	20.8
20.9	17.8	20.5	16.7
20.3	16.2	12.4	20.5
20.9	17.5	16.9	17.5

The diagram shows this inequality to be due to an apparent decline in productivity during the first half of the forty-year period. There has, however, evidently been a readjustment of the department's estimates in 1881 to accord with the census figures, and the medial line of the diagram should in this case be broken and continued in the direction of the broken lines. This would show in one interpretation of the diagram a general, but slight, tendency toward increased productivity over most of the period and by the other interpretation a more decided tendency toward increased productivity.

The total acreage in corn in California in the several decades is 326,006, 1,101,000, 1,127,000, and 562,000. The figures representing the average yield per acre for the several decades are 37.9, 28.7, 30.6, and 29.7.

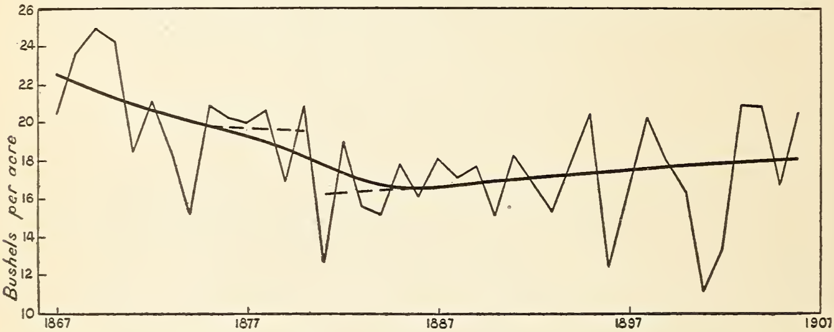

FIG. 23.—Average yield of corn in Mississippi, Louisiana, Texas, and Arkansas from 1867 to 1906.

Average yield per acre of corn in California from 1867 to 1906, by years and by decades.

1867-1876.	1877-1886.	1887-1896.	1897-1906.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
....	30.0	30.0	31.5
45.0	34.5	27.8	26.0
41.4	28.0	28.2	27.0
35.6	32.0	27.5	25.0
38.0	27.2	34.5	31.0
35.0	28.3	30.3	30.5
41.0	24.5	37.1	30.7
36.2	30.0	19.3	28.6
36.3	24.7	34.5	32.0
33.0	27.2	37.0	34.9
37.9	28.7	30.6	29.7

The diagram shows a decided falling off in the first fifteen years, after which the general trend of the medial line is upward. The falling off appears to be real, as there is no appearance of a readjustment of the Department's estimates as there is in so many of the groups of States.

Summing up the evidence regarding the yield per acre of corn in the several States, it may be stated that there is no justification for

the popular belief that the yield is decreasing in the United States or in any considerable portion of it, either on the soils of the older States in the East and South or on the soils of the newer States of the central or western part of the country; in the States which use commercial fertilizers or in those that do not. The acreage in corn in most of the States having increased considerably it is not possible to determine the effect of this increase on the yield per acre as was done in the case of wheat.

If any positive conclusion is to be drawn from the figures, it would have to be that the productivity of the soils of the United States and of the several States has increased during the past forty years as measured by the yield of corn.

With the full analysis of the data for the two important crops of wheat and corn, it seems unnecessary for the purpose of this report to discuss the data relating to oats, barley, rye, hay, buckwheat, potatoes, and cotton, especially as an inspection of the data fur-

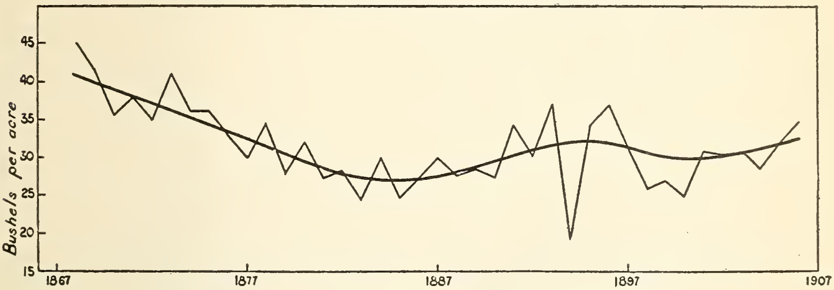

FIG. 24.—Average yield of corn in California from 1867 to 1906.

nished by the Bureau of Statistics on these crops shows the same general facts as are shown by wheat and corn and would add nothing material to this discussion. The only inference, therefore, which can be drawn from the statistics of crop production is that the productivity of the soils of the United States has not declined in the past forty years, but that, on the contrary, it has increased.

EVIDENCE PRESENTED BY THE YIELD OF CROPS ON INDIVIDUAL FARMS.

It may be argued that the statistics which have been presented for States do not represent the same soil or the same farms throughout the period, and this is undoubtedly true. But records of actual yields from the same farm for a long period of years are extremely rare. There are no such records for farms in the United States so far as the examined literature shows. Possibly if a thorough search were made a number of family records could be found of the annual yield of crops on individual farms which had remained in the same

family for fifty to one hundred years or more and such data would be of much interest if made available.

Such investigations into old family records has recently been taken up in France and Germany with the most interesting and valuable results.

Kellermann has made a most exhaustive investigation and report upon the increase in crop production in Germany.[a] He gives the yields per acre of a large number of estates which have been handed down from father to son, some of the records going back to the middle of the sixteenth century. Three cases only will be given here, which show the general trend of the information he was able to gather.

Yield of cereals in Schmatzfeld (Germany).

[Reduced to bushels per acre.]

Year.	Wheat.	Rye.	Barley.	Oats.
1552–1557	12.5	13.2	14.2	14.8
1660	....	12.8	8.3	12.3
1670	14.6	17.2	16.1	17.4
1822	18.7	24.3	33.7	26.2
1825	18.1	20.0	28.1	32.5
1830	18.7	21.2	35.6	46.2
1840	25.6	30.0	31.6	45.5
1850	28.7	33.1	39.3	50.1
1860	35.3	39.3	32.9	62.9
1870	27.6	20.4	43.8	46.6
1886	37.9	28.9	43.2	66.6
1887-1896	40.0	29.6	47.6	59.7
1897–1904	45.1	34.0	50.4	69.1

The period from 1552 to 1557, apparently the average for those years, gives a yield of wheat of 12.5 bushels per acre; in 1670 there is a record of 14.6 bushels; in 1822 of 18.7 bushels; in 1825 of 18.1 bushels; in 1840 of 25.6 bushels; in 1850 of 28.7 bushels; in 1860 of 35.3 bushels; in 1897 of 45.1 bushels; an increase in those three hundred years from 12.5 bushels in 1552 to 45.1 bushels in 1897–1904, the record showing a regular increase with a few fluctuations which are probably due to seasonal conditions.

Rye has increased during the same time from 13.2 bushels in 1552 and 12.8 bushels in 1660 to 30 bushels in 1840 and 34 bushels in 1897.

Barley has increased from 14.2 bushels in 1552 or 8 bushels in 1660 to 16.1 bushels in 1670, and finally to 50.4 bushels in 1897.

Oats have increased from 14.8 bushels in 1552–1557, the first record, to 69.1 bushels in 1897–1904, which is the last record.

[a] Landw. Jahrb. 35, 289 (1906).

Yield of cereal crops on Rittergut Trebsen, near Leipzic.

[Reduced to bushels per acre.]

Year.	Wheat.	Rye.	Barley.	Oats.
1756–1765	26.41	15.91	14.25	23.03
1766–1775	13.25	12.33	21.71	23.48
1776–1785	16.63	14.47	20.44	23.45
1786–1795	13.98	13.67	16.77	19.16
1796–1800	13.89	15.36	15.16	17.90
1814–1816	15.28	15.68	25.41	25.72
1820–1822	16.90	19.14	18.28	26.36
1825–1834	21.04	21.63	30.19	31.83
1835–1844	33.40	27.92	36.66	46.54
1845–1849	25.51	28.75	....	56.25
1883–1892	27.03	23.06	30.95	44.64
1893–1894	29.85	28.36	30.95	54.74
1895–1899	35.85	30.45	35.39	51.15
1900–1904	36.14	32.52	43.23	57.80

From this estate apparently more nearly continuous records are given in five and ten year periods from 1756 to 1904. The average yield of wheat in the first period of which we have a record, 1756–1765, is 26 bushels; in the next period, 1766–1775, it is 13 bushels; and from that time a gradual increase up to 1900–1904, when it was 36 bushels. Rye increases similarly by regular steps from 15.91 bushels to 32.52 bushels; barley from 14.25 bushels to 43.23 bushels; oats from 23.03 bushels to 57.80 bushels.

Yield of cereals on Gut I, of Conrad.

[Reduced to bushels per acre.]

Year.	Wheat.	Rye.	Barley.	Oats.
1800–1810	21.15	14.64	19.80	17.22
1810–1820	20.02	11.76	20.92	13.44
1820–1830	23.25	17.76	21.29	14.84
1830–1840	18.82	15.04	16.37	13.86
1840–1850	23.10	19.84	20.83	27.58
1850–1855	26.40	23.12	32.75	33.46
1855–1860	25.27	24.16	27.71	34.44
1860–1865	29.77	30.48	37.85	44.52
1865–1870	27.45	26.48	36.17	55.72
1870–1875	29.92	28.32	35.71	51.38
1875–1880	28.12	24.32	29.38	39.48
1880–1885	25.57	25.12	36.45	45.08
1885–1894	35.70	29.52	41.06	43.96

On this estate from 1800 to 1894 in ten-year averages wheat increased from 21.15 to 35.70 bushels, rye from 14.64 to 29.52, barley from 19.8 to 41.06, and oats from 17.22 to 43.96.

Kellermann throughout cites many well-known authorities and refers to many sources of information, and concludes his article with this remarkable statement:

> If we now make a brief survey of the results obtained in the foregoing, we must affirm that the development of the yields of cultivated soil since the beginning of the past century presents a very pleasing picture, not only that agriculture, by absolute addition to the acreage of 30 to 35 per cent and decrease in fallow from 33 to 4½ per cent,

has tried to meet the growing needs of the nation for food, but above all that it has shown how to gain from the soil gradually $2\frac{1}{2}$ times as much per unit of surface as formerly.

The same facts have been brought out by Steinbrück,[a] who cites many cases of individual farms from records going back for one hundred years or more.

EVIDENCE PRESENTED BY THE CHEMICAL COMPOSITION OF THE SOILS OF THE UNITED STATES AS COMPARED WITH THOSE OF EUROPE.

The soils of the countries of northern and middle Europe are to-day producing from two to three times as large yields of the staple farm crops as the soils of the Northern and Middle States of the United States. They are, therefore, removing from the soil more of the mineral plant-food constituents. The soils are older agriculturally in that the countries have been settled for one thousand to two thousand years longer for agricultural pursuits than the United States. The soils as a whole were, no doubt, similar originally in composition, as they are derived from the same class of rock materials. If, as some suppose, there is danger of permanent loss of fertility of our soils through loss of mineral plant-food constituents or any one essential constituent through the removal of our very moderate crops for one hundred or two hundred or even for one thousand years, the cropping records of European soils would be expected to have resulted in some significant difference in lower content of mineral plant-food constituents at the present time as compared with the newer agricultural soils of the United States.

For the purpose of such a comparison all analyses of soils by the acid digestion method, the results of which are available to us in the literature of the past eighteen years, have been compiled and are presented in the following tables so far as they pertain to the soils of Great Britain, Ireland, Germany, France, and the United States. It is in these countries where the most active work has been done and about which the most results have been published. There have been found and are presented in this bulletin the results of the analyses of 1,857 samples of soil from all parts of the United States, 286 samples from Great Britain and Ireland, 1,550 samples from France, and 449 samples from Germany. This makes a total of 4,142 analyses available for comparison.

So far as it has been possible to determine from the description of the analytical work all of the results used in this bulletin have been obtained from recognized methods of "acid digestion" with con-

[a] Der Boden und die landwirtschaftlichen Verhältnisse des Preussischen Staates, vol. 7, p. 799 (1906), edited by August Meitzen.

centrated acid, and only the results pertaining to the top soil have been taken; the results pertaining to the subsoils having been rejected. This has been done to make the data strictly comparable.

It will be remembered that rocks vary greatly in their ultimate chemical composition accordingly as one or more of the common minerals predominate to give the essential character to the rock. Soils vary in ultimate chemical composition and, according to the mode of their formation, soils are generally more complicated than the rocks with respect to the minerals they contain. It is as difficult, therefore, to intelligently compare soils from their chemical composition, unless the physical characteristics are known, as it would be to compare or identify rocks from chemical data alone. As soil classification and soil surveying are new and not on an international basis, it is impossible to compare soils from different countries in any classified or systematic way from the data given in connection with the analyses.

Johnson wrote in 1869: [a]

> Notwithstanding an immense amount of labor has been expended in studying the composition of soils, and chiefly in ascertaining what and how much, acids dissolve from them, we have, unfortunately, very few results in the way of general principles that are of application, either to a scientific or a practical purpose. In a number of special cases, however, these investigations have proved exceedingly instructive and useful.

This applies now to the ordinary chemical analyses of soils as well as it did forty years ago.

The chemical composition of soils varies so greatly without any obvious law of general relationship to crop production that averages mean little or nothing and the figures are given without any attempt at averaging. The average amount of potash in all soils reported upon would probably be not far from 0.3 per cent. The extreme amounts reported in the following tables for all countries are 0.003 to 11.37 per cent. The average amount of phosphoric acid in all soils reported would probably be not far from 0.16 per cent. The extremes given in the following tables are 0.003 to 7.14 per cent. The extremes for lime are 0.002 to 94.7 per cent. The extremes for magnesia are 0.001 to 16.97 per cent.

Too much importance should not be paid to moderate differences in composition, as soils are liable to vary greatly in the same field. An excellent illustration of this is given in the results from St. Viaud, France; 73 samples were taken from a field of approximately 250 hectares (617 acres), of which the separate analyses are given us as shown in the following table.

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[a] Samuel W. Johnson, "How Crops Feed," p. 331.

Composition of 73 samples of soil taken from a field of about 617 acres in St. Viaud, France.

Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
....	0.07	0.03	0.16	0.13	....	0.18	0.06	0.08	0.07
....	.21	.09	.17	.15	....	.20	.06	.20	.09
....	.17	.04	.29	27	....	.18	.08	.12	.51
....	.14	.04	.26	.16	....	.12	.04	.11	.72
....	.12	.06	.16	.12	....	.15	.07	.21	.76
....	.23	.08	.13	.21	....	.10	.06	.15	.54
....	.21	.06	.10	.26	....	.11	.05	.12	.45
....	.09	.06	.15	.06	....	.15	.06	.27	.39
....	.17	.04	.16	.19	....	.20	.06	.12	.20
....	.20	.09	.13	.14	....	.14	.08	.22	.17
....	.24	.03	.35	.60	....	.12	.04	.06	.27
....	.12	.06	.32	.23	....	.25	.08	.09	.20
....	.14	.06	.18	.12	....	.12	.04	.05	.04
....	.22	.08	.18	.31	....	.18	.07	.21	.36
....	.19	.07	.12	.30	....	.20	.08	.10	.25
....	.16	.07	.16	.24	....	.22	.06	.16	.34
....	.21	.06	.18	.56	....	.12	.07	.09	.21
....	.17	.05	.47	.37	....	.20	.06	.10	.12
....	.10	.09	.16	.44	....	.22	.09	.18	.37
....	.14	.05	.30	.23	....	.25	.06	.15	.31
....	.14	.04	.24	.20	....	.25	.03	.17	.51
....	.15	.06	.08	.14	....	.24	.07	.12	.11
....	.21	.05	.30	.17	....	.22	.05	.09	.05
....	.15	.06	.15	.31	....	.23	.07	.07	.09
....	.10	.05	.18	.24	....	.21	.05	.09	.20
....	.16	.06	.27	.33	....	.22	.07	.27	.10
....	.12	.04	.14	.18	....	.15	.06	.10	.12
....	.18	.06	.11	.26	....	.12	.05	.20	.15
....	.15	.08	.22	.15	....	.13	.06	.19	.17
....	.10	.07	.39	.23	....	.10	.04	.47	.13
....	.17	.08	.18	.25	....	.14	.05	.13	.10
....	.15	.09	.33	.34	....	.18	.06	.11	.09
....	.12	.04	.12	.38	....	.17	.05	.38	.53
....	.11	.06	.12	.40	....	.51	.04	.17	.12
....	.20	.06	.10	.12	....	.16	.04	.18	.10
....	.09	.04	.07	.03	....	.15	.04	.16	.09
....	.10	.10	.06	.04					

In this field the potash varies from 0.07 to 0.51 per cent, phosphoric acid from 0.03 to 0.10 per cent, lime from 0.05 to 0.47 per cent, and magnesia from 0.03 to 0.60 per cent. This range in composition in this single field would cover most of the 1,565 samples reported from France; so that it would appear that there is no significant difference in composition with respect to these four mineral plant-food constituents in most of the soils of France which have been examined and reported upon.

Another reason why too much consideration should not be given to slight differences in composition is the unavoidable error of analysis. For a number of years it has been the practice of the referee on soils of the Association of Official Agricultural Chemists to submit samples of soil to various analysts for examination. These samples are thoroughly prepared by grinding, sifting, and mixing and careful subsampling to insure thorough uniformity in the samples which go to the different individuals. The method of analysis is explicitly prescribed so as to insure, as far as possible, uniformity in results. The following tables of results show the agreement:[a]

[a] Bulletin No. 43, Bureau of Chemistry (1894), p. 33.

Variations in results of analyses of the same sample of soil by eight analysts.

[Provisional method: Thirty-six hours' digestion.]

Analyst.	K_2O.	Na_2O.	P_2O_5.	CaO.	MgO.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
A	....	....	0.429	....	....
B	0.397	0.76	.480	0.585	0.519
C	.470	.155	.486	.521	.407
D [a]	.275	.280	.580	.360	.360
D [b]	.340	.140	.560	.410	.390
D [c]	.450	.140	.530	.430	.400
E [d]	.330	.125	.600	.430	.375
F	.49	....	.16	.60	....
G	.44	....	.48	....	....
H	.48	....	.47	....	....

[a] Digestion in Snyder flask.
[b] In platinum flask and condenser.
[c] In platinum bottle, stoppered.
[d] Reported as dried at 110° C., figured to original soil by reporter.

The extreme variation here representing the possible limit of error has been: For potash 0.2 per cent, for phosphoric acid 0.44 per cent, for lime 0.24 per cent, and for magnesia 0.16 per cent.

Variations in results by eight analysts—phosphoric acid and potash calculated as per cent of the dried fine earth.[a]

[Official method: Ten hours' digestion in HCl of 1.115 sp. gr.]

Analyst.	K_2O. Sample No.—				P_2O_5. Sample No.—			
	1.	2.	3.	4.	1.	2.	3.	4.
A	0.359	0.154	....	....	0.447	0.268	0.409	0.230
B	....	....	....	....	.420	.210	.462	.244
C	.345	.112	0.380	0.04	.430	.117	.449	.095
D	.354	.235	.396	.225	.324	.201	.421	.267
E	.260	....	....	....	.510	....	....	....
F [b]	.373	.179	.365	.175	.451	.172	.396	.193
F [c]	....	....	....	....	.412	.185	.383	.190
G	.210	.130	.220	.100	.460	.210	.500	.220
H	.304	.125	.286	.158	.425	.163	.422	.176

[a] Bulletin No. 47, Bureau of Chemistry (1896), p. 36. [b] Gravimetric. [c] Volumetric.

The extreme variation here has been for the various soils; For potash, 0.16, 0.12, 0.18, and 0.18 per cent, respectively; for phosphoric acid 0.19, 0.15, 0.12, and 0.15 per cent, respectively.

Variations in results by nine analysts—phosphorus soluble in fifth-normal nitric acid.[a]

[Parts per million in dry soil.]

Analyst.	No. 1.	No. 2.	No. 3.	No. 4.	Analyst.	No. 1.	No. 2.	No. 3.	No. 4.
A [b]	15.0	8.0	5.0	158.0	C	14.0	7.7	3.1	163.4
A	22.0	15.0	10.0	175.0	D	10.6	5.7	3.6	145.6
A [c]	18.0	10.0	5.7	158.0	D	....	5.6	....	....
A	18.0	11.0	6.0	158.0	E	16.7	9.7	6.4	157.1
A [d]	14.4	7.4	4.4	165.5	F	31.7	15.2	25.5	167.4
A	14.0	7.4	4.8	162.0	G	14.4	7.8	4.8	165.4
B	13.4	5.8	3.6	155.5	G	14.6	7.8	4.8	166.0
B	12.9	6.1	2.8	154.5					

[a] Bulletin No. 105, Bureau of Chemistry (1907), p. 144.
[b] Work done according to directions sent out.
[c] Baking of residual omitted.
[d] Baking omitted and phosphorus determined by Kentucky method.

Variations in results by five analysts—potassium soluble in fifth-normal nitric acid by official method.[a]

[Parts per million in dry soil.]

Analyst.	No. 1.	No. 2.	No. 3.	No. 4.	Analyst.	No. 1.	No. 2.	No. 3.	No. 4.
A	99.2	130.0	141.7	236.0	D	89.3	107.9	120.8	189.1
A	88.7	135.9	139.8	233.1	E	91.3	136.0	142.5	244.9
B	113.0	128.0	188.0	276.0	E	96.1	133.8	139.8	249.9
C	95.5	127.9	135.5	234.4					

[a] Bulletin No. 105, Bureau of Chemistry (1907), p. 144.

The determinations in the above tables being expressed in parts per million instead of in per cent can not be directly compared with the first two tables, but it is seen that the proportional variation is about the same.

The aggregate area of the three countries selected for a comparison of the soils with those of the United States is but a relatively small part of the continent of Europe. The total area of Europe is estimated at 3,550,000 square miles, according to Rohrbach, and 3,760,000, according to Wagner-Supan; of continental United States at 2,974,159 (land area) square miles. The area in square miles of the European countries selected for a comparison of the chemical composition of the soils with those of the United States covers only about one-sixth of the continent. The areas, as given in the Statesman's Yearbook, are as follows:

	Square miles.
Great Britain and Ireland:	
England	50,848
Wales	7,467
Scotland	30,405
Ireland	32,360
	121,080
Germany	208,780
France	207,054

The land area of some of our own States with which these figures are comparable are:

	Square miles.
Texas	262,398
California	156,092
Minnesota	80,858
Missouri	68,727
Illinois	56,002
Alabama	51,279
Florida	54,861
New York	47,654
Pennsylvania	44,832

THE CHEMICAL COMPOSITION OF THE SOILS OF THE UNITED STATES.

The following table contains the results of all the analyses made in the United States by the "acid digestion" method during the past eighteen years, so far as they have been found in the literature. A summary of the findings is given immediately following the table:

Chemical composition of the soils of the United States.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
California[a]	1	0.555	0.230	0.955	1.052
Illinois	3	.161	.066	.210	.247
	5	.525	.106	.610	.643
Kansas	7	.643	.089	.575	.501
Indiana	9	.496	.166	.465	.450
Massachusetts	12	.153	.144	.525	.558
Michigan	14	.118	.064	.490	.275
Missouri	16	.272	.121	.405	.550
Montana	18	.731	.185	.870	.907
New York	19	.321	.189	.250	.518
South Dakota	22	.390	.153	.665	.628
Texas	25	.095	.032	.175	.162
Wisconsin	27	.230	.125	.405	.412
Illinois	35	.580	.085	.520	.886
Iowa	39	.337	.137	.790	.585
New York	51	.351	.156	.140	.585
California	63	.594	.163	1.535	1.726
	65	.508	.117	.900	1.542
Illinois	69	.156	.070	.230	.218
	70	.479	.185	1.455	.989
Indiana	73	.384	.105	.370	.450
Iowa	74	.365	.093	1.185	.662
Kansas	76	.766	.128	.675	.615
Michigan	80	.134	.066	.405	.281
Montana	84	.747	.176	.970	1.105
New York	85	.246	.202	.125	.549
South Dakota	87	.365	.147	.710	.585
Texas	89	.053	.035	.150	.104
Wisconsin	90	.295	.163	.535	.457
Washington:[b]					
Yakima County	17	1.07	.13	2.00	1.34
Kittitas County	37	.70	.18	2.08	1.47
Oregon,[b] Morrow County	79	.89	.18	1.37	1.08
Alabama[c]	....	.15	.017	.051	.01
Butler County	1129	.182	.029	.275	.293
Talladega County	1131	.903	.150	.289	.633
Pike County	1133	.149	.032	.039	.062
Arizona:[d]					
Glendale	3	.955	.244	2.213	2.535
	4	.528	.148	3.028	1.991
	5	.777	.220	2.721	2.441
	6	.472	.140	2.883	2.025
Granite Mountains	11	.671	.059	2.068	1.391
Orangewood	10	.630	.112	2.453	1.668
Tempe	17	.783	.080	1.336	1.317
	14	.593	.058	1.354	1.188
Glendale	1	1.025	.053	.981	1.764
	2	.563	.122	1.282	1.356
Orangewood	9	.860	.106	1.284	1.713
Glendale	7	.818	.207	2.703	2.326
Mesa	19	1.959	.227	1.240	2.102
	8	.970	.210	2.419	2.541
Tempe	16	1.094	.179	5.711	3.086
	18	1.045	.147	2.611	2.013
	15	.683	.149	3.513	1.466
Glendale	12	.777	.053	4.205	1.564
	13	.686	.045	2.854	1.447
Casa Grande	20	.534	.031	.579	.775
California, Needles[d]	21	.928	.185	6.427	....

[a] This and following samples, to and including number 90, analyzed by Moore, Jour. Am. Chem. Soc. *24*, 85 (1902).
[b] Hilgard, Weather Bureau Bul. No. 3, p. 18 (1892).
[c] Bul. 3, n. s. Alabama Agr. Expt. Sta., No. 3, p. 13 (1889).
[d] Bul. 28, Arizona Agr. Expt. Sta., pp. 77-92 (1898).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
California: [a]		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Amador County	1291	0.64	0.05	0.20	0.18
	1294	.26	.07	.17	.16
	1115	.53	.05	.50	.30
	1113	1.48	.05	.60	2.21
Butte County	1139	.26	.07	6.10	1.23
Shasta County	1028	.273	.041	.113	.306
Merced County	1192	.26	.03	.49	.33
Fresno County	1061	.418	.028	1.417	1.955
	1065	.29	.02	1.02	.63
	1055	.82	.07	1.14	1.58
	1189	1.32	.06	.99	1.54
	1190	.67	.16	1.31	1.74
	1191	1.01	.08	1.10	1.28
Alameda County	1029	.28	.70	8.21	.43
Santa Clara County	999	.31	.11	1.39	16.97
Napa County	1075	1.48	.08	.30	1.43
	1077	.67	.08	2.49	10.77
Sacramento County	880	.65	.08	.71	1.71
Contra Costa County	1230	.24	.06	.66	.34
San Bernardino County	809	.79	.11	1.51	1.24
	812	.97	.05	1.65	1.68
	1406	.87	.14	1.57	1.33
	1536	.73	.07	1.58	1.85
	1537	.69	.03	1.71	1.78
	1248	.74	.09	1.11	1.40
	1251	1.17	.11	1.19	1.29
	1246	.68	.12	1.15	1.30
	1253	1.17	.11	.96	1.27
San Diego County	1238	.64	.06	1.06	....
	1092	1.42	.35	2.20	2.09
Arizona: [a]					
Near Yuma	506	1.18	.13	8.67	2.97
Gila River Valley	1195	.66	.23	6.26	.66
California: [b]					
Sutter County	1645	.74	.24	2.06	2.13
Tehama County	1636	.50	.26	.81	1.14
Sacramento County	1698	.49	.20	1.45	.94
	1699	.62	.11	1.55	.94
Kern County	1466	1.04	.22	1.29	1.24
Sonoma County	1647	.99	.16	.90	1.97
Napa County	1655	1.28	.09	.54	.91
Alameda County	1679	.73	.19	1.15	1.08
San Luis Obispo County	1693	.51	.29	1.04	.34
San Benito County	1704	.45	.16	1.16	2.09
Ventura County	1714	.47	.21	.67	.57
Riverside County	1758	1.37	.23	4.23	3.80
	1759	.84	.12	2.19	2.32
	1760	1.16	.28	8.00	5.69
	1761	1.01	.22	13.94	6.16
Orange County	1016	.80	.08	2.04	1.92
Tulare County	1159	1.20	.10	1.86	1.81
	1157	1.31	.14	1.70	1.96
	1163	1.24	.09	3.06	2.71
East Highlands	1984	.98	.13	.96	1.42
Riverside	1406	.87	.14	1.57	1.33
Corona	....	1.17	.11	1.19	1.29
Wheatland	2403	.42	.20	.72	1.45
	2405	.42	.14	.97	1.83
	2408	.65	.21	.83	1.50
	2411	.23	.09	.25	.29
Salton Basin	2324	.76	.23	4.35	1.24
	2325	.74	.22	3.75	1.68
Berkeley	2430	.33	.07	.76	.76
Colorado: [c]					
Arkansas Valley	1	.23	.23	2.80	.97
	2	.27	.22	1.28	.97
	3	.59	.21	3.69	1.61
Yuma	4	.39	.14	1.46	.69
Fort Collins	5	.56	.16	3.58	.73
	6	.62	.15	2.17	1.00
	7	.41	.21	.70	.85
	8	.66	.29	.91	.69

[a] Ann. Rep. Cal. Agr. Expt. Sta., 1890, pp. 23–50.
[b] Results for this and the following samples to and inclusive of 2411 from Ann. Rep. Cal. Agr. Expt. Sta., 1899–1901, 1893–4, 1894–5, 1895–1907; Nos. 2324 to 2425, from Bul. 140, Cal. Agr. Expt. Sta. (1902); No. 2430 from Bul. 143, Cal. Agr. Expt. Sta. (1907).
[c] Buls. 9 and 10, Colo. Agr. Expt. Sta. (1890).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O.)	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Colorado—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
San Luis	9	0.41	0.23	0.67	0.54
	10	.27	.23	.81	.56
	11	.14	.14	.68	.67
Fort Collins		.41	.21	.70	.85
Florida: [a]					
Lake City	D		.02	.03	.02
	E		.70	.34	.13
			.07	.06	.03
			.02	.03	.05
Auburndale	16		.01	.10	.03
	7		.005	.007	.001
	18		.005	.008	.003
Tobacco soil	1	.018	.053	.130	.008
Tobacco soil (Cuban)	2	.160	1.60	7.60	.17
Pineapple soil		.006	.012	.000	.009
Orange soil		.014	.018	.034	.022
Cotton soil		.010	.032	Trace.	.020
Indiana: [b]					
Newton County		.47	.17		
		.23	.22		
Hendricks County		.680	.284		
		.181	.222		
Fountain County		.428	.123		
		.281	.154		
Delaware County		.32	1.01		
		.35	.46		
		.21	.16		
		.22	.36		
Kentucky: [c]					
Hodgenville	2003	.090	.172	.080	
Lagrange	2004	.190	.182	.190	
Beard	2130	.532	.096	.198	
	2131	.515	.080	.175	
Newport	2276	Trace.	.592		
Lexington	2501	.510	.537	.605	.503
	2502	.480	.445	.425	.393
Casky	2600	.310	.117		
Meade	6039	.178	.030		
	6040	.249	.040		
	6041	.204	.055		
	6943	.214	.060		
	6944	.308	.039		
Shelbyville	7716	.096	.27	.26	
Scottsville, Allen County	7720	.120	.015	.120	
Lincoln County	7885	.169	.064		
Logan County	8457	.397	.073		
Lewis County	8599	.251	.038		
Boone County	8810	.223	.090		
	8847	.234	.090		
Marshall County	8856	.308	.038		
	8857	.411	.042		
Kenton County	8897	.357	.094		
Breckenridge County	9541	.26	.07		
	9802	.160	.158		
Casey County	9800	.159	.069		
Fayette County	10249	.318	.475	.520	.320
Henry County	9798	.264	.123		
Hopkins County	9623	.145	.052		
	9624	.165	.072		
Livingston County	10493	.471	.263		
	10494	.505	.230		
	10495	.475	.170		
	10496	.214	.030		
Pulaski County	9766	.141	.030		
Grayson County	11067	.148	.063		
Meade and Hardin counties	11068	.134	.074		
Henderson County	11188	.273	.077		
Hickman County	11170	.224	.080		
	11171	.440	.118		
Hopkins County	11174	.162	.064		
Lincoln County	10735	.160	.041		
Logan County	11119	.220	.155		
Boone County	14398	.206	.076		

[a] Bul. 5, Fla. Agr. Expt. Sta. (1899); Bul. 6 (1889); Bul. 19 (1893); Bul. 87 (1906).
[b] Bul. 95, Ind. Agr. Expt. Sta., pp. 25–29 (1903).
[c] This and following samples to and including No. 8599, Rep. Ky. Agr. Expt. Sta., 1892, 1893, 1894, 1899, 1901, 1902, 1903; Nos. 14398 to 14604, Bul. 126, Ky. Agr. Expt. Sta.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Kentucky—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Boyd County	14401	0.130	0.064	....	....
Casey County	14407	.542	.058	....	....
Clark County	14411	.710	.377	0.500	0.480
	14412	.732	.455	.600	.500
	14610	.549	1.335	.725	.280
	14613	.646	1.755	1.100	.240
	14654	.375	.855	.712	.400
	14618	.638	1.695	1.175	.320
	14648	.455	.485	.739	.420
	14616	.407	.710	.350	.200
	14650	.407	.512	.607	.520
	14652	.401	.755	.739	.480
Fayette County	14408	.360	.132	....	....
	14409	.576	.182	....	....
	14498	.417	.524	....	....
	14577	.582	.302	....	....
	14490	.405	.450	.400	.400
	14491	.400	.444	.475	.520
	14492	.380	.390	.400	.400
	14493	.410	.562	.600	.480
	14494	.407	.590	.650	.480
	14495	.452	.770	.725	.420
	14482	.435	.490	....	....
	14483	.437	.474	....	....
	14484	.337	.392	.300	.220
	14485	.347	.322	.350	.340
Henry County	14399	.278	.356	....	....
	14477	.300	.274	....	....
Knox County	14633	.125	.042	....	....
Muhlenberg County	14636	.483	.120	....	....
Ohio County	14410	.262	.040	.200	.300
Pendleton County	14400	.202	.096	....	....
Rockcastle County	14480	.180	.038	....	....
	14499	.350	.054	....	....
Warren County	14509	.430	.070	....	....
	14592	.188	.046	....	....
	14593	.256	.055	....	....
	14594	.307	.050	....	....
	14595	.280	.025	....	....
Woodford County	14513	.340	.428	....	....
	14606	.472	.625	....	....
	14604	.548	1.385	1.725	.240
Louisiana [a]	1a	.100	.064	.170	.114
	2a	.120	.112	.060	.021
Maine,[b] Scarboro	cccxcv	.14	.17	....	....
Maryland: [c]					
Washington County	133	.55	.50	.56	....
	134	.35	.32	.56	....
	463	.45	.24	.31	....
West Virginia,[c] Martinsburg	465	.43	.28	.12	....
Maryland,[c] Washington County	466	.22	.20	.56	....
	467	.32	.19	.31	....
Michigan: [d]					
Lenawee County	1	1.84	.40	1.98	1.43
	2	2.05	.41	2.10	1.59
Washtenaw County	3	1.18	.40	1.28	.86
Cass County	4	1.18	.44	2.02	.66
	5	1.10	.33	1.38	.56
Shiawassee County	6	1.85	.49	1.64	1.23
Agricultural College	7	.85	.30	1.22	.59
	8	2.12	.41	1.28	.89
	9	1.97	.31	1.46	.43
Van Buren County	10	.83	.13	.51	.46
Lake County	11	.90	.23	.62	.28
Mason County	12	.65	.22	.66	.12
	13	2.10	.30	1.00	.89
Osceola County	14	1.19	.29	.80	.64
Mecosta County	15	1.96	.44	.94	.48
	16	1.80	.33	1.14	.49
Wexford County	17	.83	.15	.65	.24
Missaukee County	18	1.95	.28	1.15	.98
Grand Traverse County	19	.89	.13	1.37	.41
Benzie County	20	1.10	.21	.55	.27
Antrim County	21	.98	.18	.95	.36

[a] Bul. 22, La. Agr. Expt. Sta., 1893, p. 739.
[b] Ann. Rpt. Me. Agr. Expt. Sta., 1894, p. 15.
[c] Ann. Rpt. Md. Agr. Expt. Sta., 1889, p. 86.
[d] Bul. 99, Mich. Agr. Expt. Sta., 1893, pp. 6–15.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO.	Magnesia (MgO).
Michigan—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Grayling	22	0.20	0.05	0.20	0.12
	23	.33	.04	.24	.17
	24	.30	.01	.32	.15
Kalamazoo	26	.34	.88	6.09	.81
Grand Haven	27	.20	.69	5.02	.62
Luce County	28	.42	.46	4.18	.75
Isabella County	29	.86	.19	.87	.27
Midland County	30	1.85	.49	1.64	1.23
Clare County	31	.54	.15	.36	.16
	32	1.90	.36	.99	.73
Lake County	33	.73	.14	.35	.30
Gratiot County	34	.92	.14	.68	.30
Bay County	35	1.18	.38	1.18	.46
Montcalm County	36	1.13	.20	.82	.31
Otsego County	37	.61	.14	.40	.13
Iosco County	38	1.10	.16	.93	.36
Minnesota: [a]					
Red Wing	285	.15	.10	.47	.21
Gilford	265	.33	.10	.56	.38
Good Thunder	269	.46	.09	.60	.16
Langdon	290	.17	.15	.48	.20
Eden Prairie	304	.11	.22	.74	.41
Faribault County	300	.30	.19	.70	.40
Grant County	266	.21	.10	1.00	.42
McLeod County	234	.25	.20	.23	.36
Martin County	261	.31	.15	.58	.19
Meeker County	302	.25	.18	2.48	.97
Goodhue County	257	.16	.30	.76	.81
Warren	203	.54	.38	2.44	1.85
	298	.50	.31	2.40	1.91
Crookston	202	.60	.29	2.55	.67
	236	.54	.24	2.49	.62
	272	.90	.13	1.07	.84
Twin Valley	306	.18	.13	.48	.25
Gossen	308	.30	.19	1.20	.80
Moorhead	275	.73	.20	1.29	.39
	224	.45	.35	.69	.38
	312	.28	.30	.65	.77
	222	.18	.21	.61	.65
	259	.34	.21	1.00	.25
	249	.32	.26	1.53	.65
	298	.32	.25	.92	.24
Worthington	326	.36	.65	1.06	.82
Benson	214	.46	.27	13.56	2.57
Fergus Falls	208	.17	.32	.54	.33
Alexandria	210	.44	.31	1.26	.35
Wadena	245	.28	.20	.60	.60
Park Rapids	230	.26	.15	.61	.18
Henning	292	.19	.36	.63	.13
Fair Haven	273	.20	.21	.77	.25
Mille Lacs	216	.14	.22	.38	.29
Pine	236	.08	.04	.11	.12
Hinckley	228	.18	.12	.76	.25
New Duluth	232	.27	.33	.32	.51
Wyanette	288	.08	.10	.21	.13
Saint Cloud	212	.85	.19	.26	.10
Duluth	264	.25	.45	.51	.12
Farmington	277	.20	.20	.46	.18
	279	.19	.20	.48	.27
Rolling Stone	239	.30	.23	.41	.39
Faribault	280	.23	.21	.54	.30
Owatonna	283	.23	.13	.48	.18
Experiment station	242	.30	.23	.51	.26
Austin	218	.32	.38	.48	.45
Wells	220	.36	.25	1.10	.99
Mankato	294	.19	.30	.53	.11
Polk County	464	.84	.29	1.10	.59
Norman County	320	.43	.30	5.05	2.57
Polk County	317	.34	.27	.71	.63
Wilkin County	448	.37	.20	.89	.53
	446	.27	.22	1.36	.30
Lincoln County	428	.29	.15	.88	.73
Chippewa County	442	.38	.26	.56	.74
	444	.46	.26	1.05	.70
Kandiyohi County	414	.25	.21	.70	.43
Grant County	266	.21	.10	1.00	.42
Martin County	261	.31	.25	.58	.19

[a] This and the following samples to and including No. 257 from Ann. Rept. Minn. Agr. Expt. Sta., 1893; Nos. 203 to 329, Bulls. 30, 41, and 65, Minn. Agr. Expt. Sta.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Minnesota—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Meeker County	202	0.25	0.18	2.48	0.97
Wright County	432	.13	.23	.69	.42
McLeod County	462	.17	.20	.95	.66
Hennepin County	430	.30	.38	.51	.50
	451	.29	.32	.92	.45
Ramsey County	374	.28	.19	.52	.21
Wadena County	420	.30	.45	.94	.51
Becker County	422	.25	.47	.88	.55
Todd County	418	.17	.31	.56	.26
	424	.16	.13	.47	.24
Ottertail County	456	.15	.16	.78	.17
Cass County	414	.27	.20	.28	.11
Dakota County	436	.32	.20	.31	.38
	434	.30	.28	.53	.40
Wabasha County	468	.27	.26	.67	.54
Goodhue County	285	.22	.10	.40	.17
	257	.26	.30	.76	.81
Rice County	489	.32	.16	.51	....
Houston County	483	.34	.22	.42	.47
Freeborn County	470	.27	.26	.60	.46
Fillmore County	487	.41	.12	.45	.66
Faribault County	300	.30	.19	.70	.40
Olmsted County	485	.61	.24	.30	.77
Blue Earth County	269	.46	.19	.60	.16
Washington County	440	.26	.19	.29	.43
	314	.17	.20	.28	.11
Chisago County	499	.20	.20	....	....
Pine County	426	.18	.13	.33	.29
	228	.25	.12	.76	.25
Carlton County	474	.12	2.61	.20	.39
Chisago County	497	.34	.10	.22	....
	495	.31	.11	.17	....
Pine County	501	.38	.22	.47	....
Dakota County	563	.42	.19	.41	.40
	557	.29	.16	.33	.34
	535	.44	.16	.46	.25
	513	.23	.36	.58	.69
Goodhue County	553	.40	.17	.64	.70
	521	.48	.16	.69	.61
	527	.51	.20	.70	.76
	616	.50	.20	.56	.23
	555	.44	.14	.49	.64
	577	.38	.16	.50	.51
	573	.37	.13	.59	.61
	572	.55	.17	.48	.51
Hennepin County	542	.43	.23	.42	.41
Wabasha County	515	.20	.31	.64	.72
	618	.44	.22	.41	.10
	503	.20	.38	.49	.44
Winona County	596	.38	.15	.43	.51
	597	.45	.26	.52	.45
	598	.44	.18	1.69	1.17
Freeborn County	592	.54	.27	.61	.53
	594	.46	.25	.67	....
	567	.42	.18	.52	.29
	584	....	.29	2.36	.77
	586	.29	.22	1.94	6.12
	519	.63	.11	.40	.57
Mower County	533	.37	.19	.49	.33
Fillmore County	633	.49	.32	3.22	.20
Waseca County	505	.21	.48	.53	.44
	455	.57	.22	.70	.29
Martin County	561	.57	.11	.93	.76
Watonwan County	531	.49	.15	.81	.54
	606	.45	.19	.40	.17
	607	.36	.19	.77	.37
	608	.46	.24	2.55	.20
Nicollet County	523	.52	.20	.62	.73
Sibley County	559	.43	.16	.63	.45
Renville County	511	.42	.32	.97	.60
Lyon County	599	.56	.24	.57	.67
Lac qui Parle County	568a	.50	.19	14.00	1.33
	502	.54	.29	1.65	.67
Big Stone County	537	.35	.20	.68	.73
Kandiyohi County	624	.58	.20	1.42	.38
	5[illegible]8	.34	.14	.72	.60
	590	.50	.18	1.31	.74
	[illegible]20	.62	.21	.87	.11
Swift County	609	.33	.24	.58	.33
	525	.39	.16	.99	.27

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Minnesota—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Polk County	551	0.57	0.19	0.74	0.68
Ottertail County	517	.51	.16	.97	.61
	632	.44	.14	.71	.25
Becker County	571	.73	.16	.89	.76
Norman County	612	.66	.34	4.60	2.00
	613	.60	.32	8.67	1.69
	614	.73	.16	1.10	.60
Kittson County	569	1.16	.19	1.25	.58
Hubbard County	611	.20	.04	.48	.25
Isanti County	509	.10	.23	.38	.29
Sherburne County	579	.18	.11	.28	.21
Morrison County	575	.23	.14	.44	.34
Itasca County	540	.15	.11	.42	.30
	544	.55	.07	.74	1.04
	548	.18	.13	.19	.22
Beltrami County	666	.35	.14	.76	.36
Stearns County	600	.27	.10	.51	.24
	602	.37	.09	.27	.13
	630	.43	.21	.70	.37
Chisago County	529	.36	.30	1.22	.41
Mississippi:[a]					
Senatobia	1,489	....	.270	1.560	.460
McNeil Experiment Station	....	.142	.023	.220	.162
		.210	.017	.170	.140
North Dakota:[b]					
Red River Valley (average 21 samples)	....	.54	.19	4.16	.81
James River Valley (average 5 samples)	....	.48	.27	1.07	.57
Sheyenne River Valley (average 2 samples)	....	.54	.17	14.67	.93
Mouse River Valley (average 4 samples)	....	.34	.18	2.19	.51
Devils Lake region (average 10 samples)	....	.57	.12	6.08	.61
Turtle Mountains (average 8 samples)	....	.55	.14	.77	.47
Wells County (average 2 samples)	....	.45	.19	.41	.28
Rolette County (average 7 samples)	....	.45	.25	.96	.14
West Missouri (average 2 samples)	....	.35	.19	.32	.43
Station farm	422	.45	.27	1.25	Trace.
	423	.44	.33	.83	Trace.
	424	.60	.38	.80	Trace.
	425	.73	.40	.86	Trace.
	426	.54	.38	1.01	Trace.
	427	.63	.39	.85	Trace.
	428	.50	.39	1.05	Trace.
Mayville, Old	....	.22	.37	2.10	.08
Mayville, New	....	.18	.31	2.00	.07
Station Plats	....	.77	.21	1.47	.72
	....	.61	.20	.65	.23
	1	.79	.27	1.08	.34
	2	.82	.29	1.39	.50
	24	.78	.38	1.07	.44
	25	.96	.39	1.19	.68
Oregon:[c]					
Lincoln County	1A	1.76	.06	.23	1.13
	1B	.10	.27	1.40	1.65
Washington County	1C	.03	.03	.34	1.71
	1D	.16	.32	.63	1.18
Wasco County	1E	.00	.02	.65	1.41
Washington County	1F	.12	.09	.75	.13
	1G	.28	.34	.13	.90
	1H	.26	.34	.76	.71
Benton County	1I	.11	.01	1.60	1.78
	1J	.47	.05	1.60	1.03
Polk County	1K	.24	.33	.60	.55
Washington County	1L	.11	.30	1.47	1.27
Lincoln County	1M	.12	.08	.53	.82
Washington County	1N	.19	.06	.43	1.54
Lincoln County	1O	.26	.21	.31	.52
	1P	.38	.33	.30	.40
	1Q	.33	.12	.27	.25
	1S	.16	.18	.42	.98
	1T	.22	.12	.45	2.04
	1U	.33	.11	.27	.52
Lane County	1V	.09	.16	.60	.27
Linn County	1W	.15	.11	3.51	.21

[a] Sample 1489, Ann. Rpt. Miss. Agr. Expt. Sta., 1890; samples from McNeil Expt. Sta., Bul. 99, Miss. Agr. Expt. Sta.

[b] This and the following samples from Bul. 35, N. Dak. Agr. Expt. Sta. (1899), and Ann. Rpt. N. Dak. Agr. Expt. Sta., 1901.

[c] Samples 1A to 627, Bul. 50, Oreg. Agr. Expt. Sta. (1898) samples 2382 to 2542, Ann. Rpt. Oreg. Agr. Expt. Sta., 1903.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Oregon—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Douglas County	1X	0.44	0.16	2.05	0.42
Crook County	1Y	.83	.08	1.21	1.11
Union County	1Z	.84	.07	.76	.24
Washington County	....	.18	.23	1.49	.26
Marion County	2A	.94	.13	.75	.97
	2B	.04	.28	.10	.91
Baker County	406	.51	.14	1.13	1.93
	407	.03	.02	.94	.01
Polk County	409	.02	.02	2.01	.02
	424	.39	.47	.75	.87
Washington County	425	.02	.04	.82	.85
Marion County	426	.47	.63	.40	.96
Clackamas County	447	.29	.31	.59	.80
Lincoln County	448	.11	.40	.46	.63
Washington County	449	.11	.25	.50	.00
	2N	.51	.54	.49	.71
	623	.17	.12	1.13	.38
	624	.23	.21	.04	1.45
Lane County	454	.19	.13	.65	.46
Polk County	625	.47	.22	.56	.79
Umatilla County	408	.23	.25	1.86	.09
Benton County	597	.33	.25	.89	.80
Jackson County	612	.33	.14	2.32	.83
	613	.21	.14	5.15	.72
Josephine County	615	.19	.21	2.49	.46
	615½	.27	.23	3.49	.43
Linn County	643	.39	.40	.55	.71
Wasco County	644	.12	.28	1.41	1.10
Marion County	626	.12	.29	.95	.62
	622	.46	.07	Trace.	.05
Multnomah County	629	.25	.40	1.27	1.23
Josephine County	616	1.85	.06	3.11	3.36
Douglas County	618	1.27	.28	.13	.00
Wasco County	762	.31	.22	.82	.15
	763	.20	.25	.38	.24
	764	.41	.82	.84	.24
Coos County	765	.20	.11	.52	.16
	766	.29	.38	.41	.60
Benton County	410	.06	.03	.66	.00
	411	.21	.34	.46	.05
Marion County	628	.48	.19	.32	.50
	628½	.52	.22	.34	.33
Yamhill County	768	.26	.23	.63	.63
	769	.38	.76	.43	.53
Marion County	619	.50	.35	.35	.22
	619½	.62	.30	.00	.28
Josephine County	617	.31	.05	.28	.35
	622	.30	.00	.72	.33
Marion County	627	.38	Trace.	.71	.91
	2382	....	.08	....	....
	2383	....	.15	....	....
	2407	.12	.23	.36	....
	2410	.15	.17	.24	....
	2425	.06	.11	14.36	....
	2448	.19	.21	.40	....
	2449	.18	.24	.33	....
	2450	.22	.20	.41	....
	2540	.26	.25	1.50	.64
	2541	.26	.39	5.63	2.19
	2542	.37	.36	1.25	.86
Washington[a]	11	.331	.182	1.512	1.527
	16	.530	.139	1.180	.733
	17	.432	.100	1.212	.788
	19	.202	.038	.655	Trace.
	20	.007	.054	.769	.426
	21	.136	.313	.379	.036
	22	.112	.079	1.112	.031
	25	.590	.353	.362	.281
	26	.233	.198	.397	.031
	27	.015	.140	.109	.022
	28	.277	.300	.082	.065
	29	.448	.345	.781	.122
	31	.650	.543	.431	.033
	32	.012	.311	.130	.033
	33	.047	.399	.398	.018
	34	.120	.172	.675	.116

[a] Buls. 13, 23, and 55, Washington Agr. Exp. Sta., 1894, 1902.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Washington	39	0.274	0.166	0.979	0.015
	40	.058	.159	1.758	.647
	41	.442	.191	.930	.362
Spokane County	30	.436	.265	.604	.043
	114	.374	.096	.644	.297
	119	.663	.070	.874	.072
	120	.651	.096	.908	.270
Jefferson County	42	.019	.109	.154	.335
	43	.022	.085	.579	.036
	175	.054	.089	.219	.212
San Juan County	44	.000	.106	1.468	.159
	45	.000	.365	.538	.432
	46	.000	.274	.448	.223
Okanogan County	71	.341	.112	2.084	.018
	74	.347	.288	4.679	.081
	76	.006	.096	.714	.011
	77	.019	.112	.614	.027
Whitman County	5	.635	.142	1.081	.727
	72	.471	.361	.457	.256
	73	.332	.122	.514	.283
Whatcom County	75	.006	.294	.324	.546
	78	.142	.285	.409	.000
	79	.021	.067	.359	.151
	139	.316	.139	1.234	.454
	140	.483	.054	1.044	.112
	141	.275	.144	1.322	.000
	142	.319	.266	.892	.014
Skagit County	82	.111	.090	1.049	.009
	83	.057	.070	.832	.005
	84	.006	.045	.892	.005
	85	.015	.144	.892	.007
	86	.129	.267	1.082	.006
	100	.186	.304	.474	Trace.
	101	.028	.205	.518	.018
Yakima County	91	.189	.128	2.389	.092
	92	.149	.174	.909	.068
	93	.310	.141	1.259	.364
	94	.047	.154	1.469	.421
	137	.455	.029	1.154	.013
King County	102	.004	.057	.389	....
	129	.057	.070	.599	.216
	179	.142	.390	.404	.189
Thurston County	176	.076	.320	.506	.235
Snohomish County	103	.051	.176	.414	.018
	177	.218	.237	.704	.332
Island County	105	.145	.067	.564	.357
	122	.626	.344	1.214	.209
Clarke County	162	.335	.137	.333	.054
Clallam County	111	.154	.240	.525	.023
	128	.171	.115	.834	.450
Spokane County	115	.550	.154	.432	.306
	198	.534	.216	.630	.036
	199	.385	.190	.600	.054
Okanogan County	218	.147	.245	27.940	.605
Walla Walla County	289	.378	.320	1.200	.400
	290	.465	.287	1.450	.399
	291	.485	.351	1.350	.345
	292	.440	.320	1.550	1.003
Franklin County	293	.437	.351	1.050	.299
	294	.393	.325	1.300	.362
Kitsap County	80	.085	.048	1.971	.018
	81	Trace.	.019	.308	.281
	124	.111	Trace.	.659	.032
	126	.054	.045	.534	.036
	106	.003	.029	1.296	.476
Experiment Station Farm	373	.107	.177	.150	.010
	374	.129	.136	.175	.148
	375	.117	.192	.005	.109
	376	.092	.135	.010	.091
	377	.020	.336	.220	.091
Thurston County	184	.188	.312	.638	.048
	102	.004	.058	.389	.561
	231	.189	.297	.450	.112
Pierce County	37	.003	.205	.569	.048
	219	.181	.192	.940	....
	220	.144	.409	.760	....
Snohomish County	212	.146	.217	1.140	.091
	221	.150	.307	.520	....
King County	200	.087	.159	.410	.016

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Utah: [a]		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
College Farm	90	0.046	0.115	3.45	2.29
	93	.051	.103	3.08	2.52
Cache Valley, south end	2067	1.04	.18	.83	.50
	2074	.62	.18	.69	.55
	2162	1.15	....	.60	.49
	2070	.74	.24	.86	.67
	2079	1.48	.39	1.66	2.42
	2062	.69	.24	2.10	.56
Cache Valley, west side, south half	2058	.77	.19	.84	.61
	2085	.76	.24	.85	.64
	2071	1.34	.21	1.00	.98
	2073	1.50	.27	1.01	.72
	2163	1.43	.27	1.25	.86
	2160	1.34	.25	1.28	1.16
	2166	1.09	.42	1.55	.51
Cache Valley, west side, north half	2061	.47	.14	.46	.21
	2078	.67	.18	.99	.67
	2063	.68	.16	.67	.33
	2064	.71	.20	.69	.49
	2081	1.37	.29	1.31	.50
	2065	1.51	.25	1.06	.89
Cache Valley, north end	2169	1.18	.15	1.85	.88
	2167	1.56	.30	3.14	.67
	2057	.50	.30	.67	.13
Cache Valley, east side	2055	1.16	.20	1.68	.54
	2059	1.39	.18	2.22	1.47
Middle Cache Valley	2172	1.05	.21	7.35	1.37
	2046	.53	.20	1.50	.21
	2047	.50	.25	2.43	.58
	2048	.60	.18	.59	.73
	2049	.30	.18	.54	.33
	2050	.44	.20	.56	.41
	2051	.90	.25	1.52	.18
	2052	.31	.18	.62	.31
	2053	.36	.15	.47	.26
	2084	2.69	.23	6.39	.66
	2083	1.20	.26	8.36	1.56
Sanpete Valley	1819	.27	.16	8.37	.13
	1818	.68	.21	9.81	.73
	1817	.72	.11	10.65	.07
	1816	.80	.22	13.09	.84
	1821	.51	.17	22.54	1.29
	1824	.65	.15	17.35	.29
	1826	.95	.20	14.89	.42
	1827	1.24	.24	13.16	.26
	1808	.58	.17	9.91	1.40
	1807	.67	.18	9.53	1.68
	1809	1.03	.19	14.01	1.20
	1805	.58	.14	12.84	.71
	1806	.95	.16	22.05	.85
	1825	.81	.17	13.17	1.80
	1811	.75	.23	13.99	.46
	1812	.60	.20	13.24	.59
	1813	1.25	.16	13.76	.75
	1814	.95	.12	13.17	.29
Wyoming: [b]					
Laramie Experiment Farm	5	.56	.15	1.47	.14
	7	.64	.14	.82	.76
Lander Experiment Farm	37	.68	.15	.64	1.36
	51	.61	.20	6.63	1.65
Saratoga Experiment Farm	19	.64	.12	3.41	.95
	43	.73	.13	.74	1.15
Sheridan Experiment Farm	33	.52	.28	.69	.94
Sundance Experiment Farm	27	.68	.18	4.97	3.21
Wheatland Experiment Farm	21	.63	.14	.87	.85
Tennessee [c]	1	.120	.040	.053	.140
	2	.180	.074	.060	.213
	3	.330	.104	.180	.342
	4	.312	.057	.163	.455
	5	.092	.021	.050	.085
	7	.403	.017	.073	.291
	6	.340	.022	.100	.265
	8	.218	.010	.100	.090
	9	.410	.158	.510	.290

[a] Ann. Rep. Utah Agr. Expt. Sta. (1891); Bul., 52, Utah Agr. Expt. Sta., 1898.
[b] Bul. 6, Wyo. Agr. Expt. Sta. (1892).
[c] Bul. 3, Tenn. Agr Expt. Sta. (1897).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Tennessee	10	0.393	0.078	0.278	0.355
	11	.285	.020	.093	.157
	12	.378	.026	.132	.184
	13	.409	.069	.212	.270
	14	.380	.071	.205	.246
	15	.416	.113	.199	.290
Greene County	....	.092	.021	.050	.085
Knox County	....	.180	.074	.060	.213
		.120	.040	.053	.140
Grundy County	....	.403	.017	.073	.291
Franklin County	....	.340	.022	.100	.265
Monroe County	....	.312	.057	.163	.455
Loudon County	....	.380	.104	.180	.342
Dyer County	....	.416	.113	.199	.290
Gibson County	....	.409	.069	.212	.270
Coffee County	....	.218	.010	.100	.090
Benton County	....	.285	.020	.093	.157
Carroll County	....	.378	.026	.132	.184
Fayette County	....	.380	.071	.205	.246
Maury County	....	.410	.158	.510	.290
Robertson County	....	.393	.078	.278	.355
New Hampshire[a]	1	.64	.36	.63	.62
	3_1	1.06	.16	.63	....
	3_2	1.06	.09	.76	.53
	5_1	.91	.08	.73	.74
	5_2	.97	.05	.77	.68
New York[b]	E	.95	.115	.60	1.02
	D	.89	.093	.62	.85
	D^2	.98	.134	.68	1.94
	F^1	1.04	.117	.70	1.04
Missouri[c]	1a	1.32	.08	.63	.44
	1b	1.23	.09	.55	.38
	2a	2.54	.07	.63	.40
	2b	2.57	.07	.59	.45
	3a	1.17	.06	.47	.29
	3b	1.13	.06	.42	.21
	4	1.38	.06	.62	.34
Nevada[d]	11	.488	.210	9.056	3.776
	12	.364	.125	7.492	3.031
	13	.616	.030	1.990	1.339
	14	.470	.104	11.549	2.810
	15	.628	.178	17.831	8.404
	1	.313	.479	1.86	1.03
	2	.306	.291	7.716	1.570
	3	.016	.040	9.580	2.332
	4	.302	.157	2.447	1.403
	5	.457	.223	7.223	1.283
	6	.227	.163	1.503	.690
	7	.128	.019	2.801	.574
	8	3.34	.215	1.407	1.314
	9	.277	2.292	1.900	1.521
	10	.682	.190	2.001	1.470
	1501	.81	.35	2.50	1.18
	1503	1.12	.35	2.90	.23
	1504	1.03	.32	5.00	.17
	[e] 1523	1.79	.30	4.15	.23
	1533	.68	.41	.80	4.14
	1534	1.05	.26	5.15	.22
	1508	.51	.45	4.35	1.29
	1509	.97	.73	2.70	.21
	1510	.73	.27	3.30	1.09
	1511	.42	.19	2.45	1.08
	1512	.91	.28	2.20	.26
	1513	.42	.38	1.85	Trace.
	1514	.92	.79	2.30	.18
	1515	.54	.38	3.90	1.55
	1518	.43	.19	12.00	2.34
	1519	.32	.35	7.99	1.67
	1520	.42	.32	2.40	1.10
	1521	Trace.	.30	1.55	.96
	1523	Trace.	.26	14.65	1.81
	1533	.72	.26	12.50	5.10
	1534	.45	.35	8.10	2.02

[a] Ann. Rept. N. H. Agr. Expt. Sta., 1893.
[b] Ann. Rept. N. Y. Agr. Expt. Sta., 1889.
[c] Bul. 5, Mo. Agr. Expt. Sta. (1889).
[d] Bul. 19, Nevada Agr. Expt. Sta. (1892, 1897); Ann. Rept. Nevada Agr. Expt. Sta., 1890.
[e] Nos. 1523, 1533, 1534 in this place are evidently original Nos. 1505, 1506, 1507 misnumbered.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Nevada	1545	0.46	0.55	1.60	1.06
	1546	.32	.26	1.20	.45
	1547	....	.38	1.85	.45
	1548	.32	.26	1.20	.45
	1549	.40	.38	1.48	.34
West Virginia[a]	12	.243	.153	.104	....
	13	.593	.121	.335	....
	14	.808	.167	.451	....
	15	.403	.105	.181	....
	16	.705	.103	.062	....
	17	.481	.088	.055	....
	46	.250	.115	.081	....
	47	.516	.185	.404	....
	48	.459	.184	.116	....
	49	.781	.095	.059	....
	50	.888	.121	.076	....
	51	.401	.093	.111	....
	53	.479	.211	.081	....
Ohio:[b]					
East farm, Wooster	840	.25	.07	.35	.30
	844	.24	.081	.30	.43
	830	.20	.08	.27	.48
	834	.28	.08	.29	.28
	800	.15	.064	.21	.43
	804	.15	.091	.25	.43
	810	.16	.101	.37	.42
	814	.14	.089	.23	.42
	820	.16	.11	.25	.40
	824	.19	.129	.33	.40
	850	.29	.07	.32	.23
	852	.27	.079	.20	.35
	854	.25	.08	.24	.44
	856	.24	.097	.28	.37
	858	.20	.118	.25	.43
	860	.28	.08	.30	.36
South farm, Wooster	872	.28	.151	.225	.368
	876	.27	.118	.187	.375
	862	.39	.167	.24	.45
	866	.29	.191	.20	.39
	868	.34	.156	.202	.358
University farm, Columbus	1	.64	.12	.64	.76
	4	.53	.20	.60	.52
	7	.62	.17	.59	.71
	10	.55	.17	.46	.64
	13	.59	.15	.45	.61
	16	.53	.10	.63	.58
	19	.62	.11	.68	.62
	22	.43	.12	.45	.49
Test farm, Strongville	1852	.18	.097	.20	.44
	1864	.25	.064	.16	.31
	1368	.22	.121	.10	.54
Test farm, Strongville	1874	.21	.099	.19	.34
	1880	.20	.08	.23	.40
	1884	.25	.12	.28	.40
	1810	.23	.197	.19	.42
	1820	.19	.161	.18	.56
	1826	.19	.113	.27	.461
	1832	.28	.227	.30	.57
	1838	.20	.126	.354	.44
	1844	.11	.126	.23	.54
	1846	.15	.121	.22	.50
Northwest test farm, Neapolis	1802	.05	.11	.11	.09
	1806	.05	.16	.49	.18
	1803	.06	.10	.08	.14
	1807	.06	.12	.41	.15
	1786	.046	.120	.07	.10
	1792	.060	.130	.31	.14
	1787	.040	.110	.07	.11
	1793	.090	.120	.22	.15
Germantown	4253	.142	.102	.11	.31
Carpenter test farm	4255	.193	.124	.18	.33
	4257	.181	.101	.18	.26
Wooster experiment farm, first 12 inches	....	.25	.80	.313	.356
Strongville, first 12 inches	....	.251	.145	.205	.474
Columbus, O. S. U., first 12 inches	....	.563	.143	.621	.623
Neapolis, first 12 inches	....	.043	.115	.070	.105

[a] Buls. 28 and 99, W. Va. Agr. Expt. Sta. (1892, 1906).
[b] Buls. 110 and 150, Ohio Agr. Expt. Sta.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Oklahoma:[a]					
Virgin soil, Station farm	7	0.44	0.06	0.95	0.21
Virgin soil	10	.80	.04	.44	.16
Virgin soil	5	.32	.06	.76	.18
Pennsylvania:[b]					
Donegal	....	.62	.191	.61	1.26
Rocky Springs	....	.67	.265	.41	2.05
Connecticut, New Milford	....	.23	.22	.32	.78
North Carolina, Granville County	....	.02	.02	.07	.02
South Carolina,[c] Spartanburg farm	13	.142	.057	.027	.081
	17	.090	.066	.037	.043
	15	.100	.011	.045	.110
Columbia farm	1	.171	.044	.019	.040
	3	.050	.107	.022	.072
	5	.089	.022	.046	.124
Darlington farm	19	.052	.034	.025	.043
	21	.050	.037	.062	.047
	23	.040	.051	.028	.003
Big River	....	.541	.155	.188	.811
Rhode Island:[d]					
Kingston plain	165	.155	.127	.569	.209
Kingston upland	166	.175	.106	.448	.264
Warwick	167	.124	.029	.410	.290
Lime Rock	168	.184	.092	1.295	1.141
Block Island	169	.136	.067	.273	.209
Middletown	170	.164	.099	.252	.368
East Providence	171	.126	.120	.495	.356
Tennessee:[e]					
Hamblen County	58	.12	.04	.08	.13
	55	.10	.04	.10	.12
Knox County	606	.09	.04	.12	.22
	31	.14	.03	.09	.11
	48	.16	.05	.14	.20
Hamblen County	64	.23	.04	.16	.17
Knox County	25	.28	.09	.17	.15
McMinn County	172	.38	.06	.12	.37
Hamblen County	60	.28	.10	.04	.13
	66	.08	.01	.09	.11
Knox County	32	.29	.09	.11	.10
	602	.26	.08	.12	.22
	608	.09	.03	.08	.15
Hamblen County	51	.85	.10	.82	.42
	57	.36	.07	.17	.25
Knox County	29	.43	.07	.22	.24
	821	.26	.09	.10	.30
McMinn County	174	.68	.07	.31	.53
Roane County	595	.18	.07	.06	.12
Washington County	597	.18	.07	.10	.18
Anderson County	129	.21	.17	.12	.19
Hamblen County	49	.24	.08	.12	.24
Knox County	600	.36	.16	.30	.29
	603	.41	.18	.38	.73
	30	.34	.09	.20	.35
	37	.18	.16	.18	.31
	553	.18	.11	.16	.22
Roane County	593	.30	.09	.26	.33
Blount County	35	.52	.18	.17	.56
Hamblen County	53	.91	.09	.73	.96
Knox County	26	.45	.12	.43	.48
	612	.41	.09	.41	.52
Cumberland County	605	.06	.03	.10	.10
	746	.18	.06	.06	.27
	67	.08	.02	.04	.14
Cumberland County	68	.06	.03	.04	.16
Coffee County	750	.23	.07	.23	.21
Franklin County	39	.31	.09	.21	.30
	565	.27	.10	.16	.23
	566	.34	.04	.14	.27
Humphreys County	592	.23	.05	.13	.26
Lawrence County	569	.16	.08	.08	.21
	570	.28	.06	.08	.31
Montgomery County	742	.22	.05	.14	.23
Stewart County	581	.15	.05	.12	.18
	583	.17	.51	.15	.18

[a] Bul. No. 5, Okla. Agr. Expt. Sta. (1894).
[b] Ann. Rept. Pa. Agr. Expt. Sta., 1894.
[c] Ann. Rept. S. C. Agr. Expt. Sta., 1889.
[d] Bul. 28, R. I. Agr. Expt. Sta. (1894).
[e] Bul. 78, Tenn. Agr. Expt. Sta. (1906).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Tennessee—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
White County	571	0.20	0.06	0.14	0.16
	574	.22	.07	.13	.49
	563	.21	.07	.09	.28
	564	.32	.05	.14	.34
Coffee County	867	.09	.04	.14	.15
Dickson County	591	.16	.03	.08	.24
	589	.10	.03	.10	.15
	590	.31	.02	.02	.49
Houston County	585	.15	.03	.10	.19
	586	.12	.03	.04	.24
	583	.15	.05	.09	.18
	579	.13	.09	.34	.16
Lewis County	587	.18	.02	.06	.17
	588	.25	.04	.03	.35
Putnam County	843	.07	.03	.06	.11
Warren County	806	.14	.04	.09	.14
	575	.08	.01	.07	.13
	580	.11	.01	.07	.13
Bedford County	751	.28	.14	.09	.37
	615	.17	.08	.28	.19
	616	.15	.08	.25	.21
	572	.33	.12	.24	.33
	573	.49	.05	.31	.42
	577	.46	.19	.57	.44
	578	.19	.05	.05	.19
	747	.26	.16	.14	.24
	748	.30	.11	.10	.27
	170	.32	.26	.20	.32
	171	.42	.17	.18	.40
	175	.43	.14	.56	.36
	176	.43	.15	.61	.34
Davidson County	617	.70	.06	.45	.79
Lincoln County	42	.44	.31	.31	.53
Marshall County	561	.19	.32	.20	.30
	633	.25	.26	.17	.28
	660	.33	.27	.27	.35
Rutherford County	635	.29	.08	.22	.23
Smith County	822	.22	.21	.17	.21
Sumner County	634	.24	.20	.23	.26
	160	.33	.26	.38	.28
	161	.29	.25	.20	.38
Williamson County	567	.33	.32	.20	.32
	568	.59	.97	.18	.23
Carroll County	662	.21	.07	.16	.21
	661	.32	.05	.10	.41
Chester County	659	.20	.11	.19	.21
Dyer County	664	.24	.08	.16	.25
Gibson County	158	.21	.06	.16	.25
	159	.26	.06	.11	.37
	668	.23	.08	.23	.23
Hardeman County	670	.35	.09	.22	.33
Henderson County	658	.23	.07	.16	.21
Henry County	663	.23	.07	.15	.21
Madison County	749	.31	.09	.09	.43
McNairy County	671	.20	.06	.11	.19
Obion County	669	.28	.09	.39	.42
Weakley County	666	.23	.07	.20	.24
	665	.34	.06	.11	.40
	667	.28	.08	.16	.26
Blount County	135	.76	.24	.24	.52
Giles County	576	.34	1.52	1.38	.34
	584	.42	1.70	2.25	.35
Roane County	594	.09	.04	.09	.23
White County	883	.22	.07	.13	.25
Montgomery County	871	.20	.05	.15	.23
	874	.38	.16	.25	.38
Maury County	885	.31	.21	.29	.35
Sumner County	873	.40	.38	.43	.39
Oregon:[a]					
Salem	2697	.15	.41	.37	.76
	2698	.20	.53	.48	.41
	2699	.26	.21	.80	.30
	2700	.12	.21	.54	.27
	2701	.44	.34	.32	.13
	2702	.39	.18	.45	.13

[a] Ann. Rep. Oregon Agr. Expt. Sta., 1905; Bradley Jour. Am. Chem. Soc., 28, 64 (1906).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Oregon—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Hubbard	2097	0.08	0.24	0.28	....
	2095	.14	.38	.31	....
	2096	.30	.40	.45	....
	2513	.19	.24	.71	0.56
	2525	.21	.19	.68	.87
	2539	.20	.26	.78	.85
	2554	.28	.14	1.11	.56
	2591	.10	.45	.94	.48
	2592	.18	.23	.29	.11
	2616	.51	.20	1.26	.90
	2617	.30	.22	.84	1.27
	2618	.13	.20	1.22	.79
	2619	.25	.21	1.98	1.31
	2621	.17	.19	1.09	.71
	2627	.19	.12	1.18	.29
	2623	1.16	.23	1.92	1.00
	2635	.10	.38	.54	.33
	2637	.17	.31	.48	.46
	2638	.16	.39	.67	.59
	2644	.26	.20	.76	.73
	2649	.12	.41	.67	.28
	2650	.16	.34	.94	.29
	2656	.09	.16	.55	.60
	2658	.10	.38	2.89	.60
	2689	.18	.36	.59	.18
	2690	.28	.26	1.44	.55
	2691	.43	.30	.91	.80
	2710	.43	.43	.53	.00
	2751	.43	.18	.45	.00
	2754	.37	.31	1.40	.95
	2758	.38	.38	.24	.79
	2781	.34	.09	.31	.91
	2838	.39	.22	.67	.80
	2841	.13	.14	.85	.48
	2843	.38	.25	.77	.44
	2844	.27	.34	.91	.35
	2847	.44	.25	.74	.58
	2848	.14	.24	.43	.35
	2854	.26	.16	.88	.46
	2855	.52	.39	.69	.67
	2869	.31	.25	.68	.76
	2921	.97	.24	1.35	1.24
Beaverdam soils	1	.14	.26	1.09	.22
	2	.28	.31	.26	.06
	3	.13	.22	.47	.10
	4	.10	2.30	.92	.33
	5	.20	.21	1.18	.25
North Carolina:[a]					
Oxford	....	.161	.06	.240	.047
Washington:[b]					
Spokane County	564	.829	.249	7.768	3.891
	641	.438	.108	.320	.142
	642	.304	.157	.334	Trace.
	643	.356	.300	.524	.398
	1030	.389	.185	.618	.295
Stevens County	77	.492	.122	.741	.150
	78	.225	.048	.741	.239
	161	.074	.083	.400	.234
	342	.162	.280	.350	.175
	435	.193	.400	.506	.374
	436	.229	.343	.494	.602
	655	.412	.217	.640	1.218
	656	.320	.089	.590	.469
	673	.336	.192	.499	.515
	1103	.099	.082	36.009	.684
Ferry County	446	.264	.124	.581	.548
	1872	.323	.257	.961	.262
	1873	.384	.241	.769	.216
Okanogan County	789	.294	.145	.668	.162
	790	.335	.170	.944	.319
Chelan County	158	.118	.078	.379	.301
	576	1.144	.122	1.365	.897
	1885	.518	.225	.714	.186
	1886	.649	.240	.852	.522

[a] Bul. 90 A, N. C. Agr. Expt. Sta. (1893).
[b] Bul. 85, Wash. Agr. Expt. Sta. (1908); Bul. 10, Div. of Chemistry, U. S. Dept. Agr. (1886).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Washington—Continued.					
Lincoln County	741	0.436	0.117	0.842	0.584
	742	.524	.150	.755	.746
	1890	.517	.172	.563	.070
Douglas County	868	.335	.155	5.561	.976
	1024	.312	.050	1.120	.445
	1241	.298	.125	.568	.568
	1242	.442	.147	.762	.643
	1416	.380	.102	.563	.171
Adams County	1699	.450	.042	.618	.684
	1837	.411	.120	.591	.258
Whitman County	1888	.506	.187	.508	.194
Garfield County	1134	.567	.127	.726	.847
Asotin County	1133	.320	.080	.609	.632
	1420	.434	.052	.480	.239
	1431	.426	.042	.535	.095
	1432	.391	.047	.549	.210
Walla Walla County	1698	.358	.050	.824	.306
	1842	.413	.142	1.098	.140
	1845	.328	.037	.659	.104
	1846	.426	....	.770	.140
Columbia County	1135	.467	.110	.755	.793
	1411	.431	.162	.803	.437
	1412	.387	.152	.831	.509
Benton County	142	.427	.165	3.451	1.458
	708	.329	.105	1.570	1.009
	743	.312	.140	.944	.650
	745	.288	Trace.	.987	.712
	767	.304	Trace.	1.721	.940
	782	.415	Trace.	1.250	.582
Yakima County	194	.212	.136	1.631	.703
	545	.144	.130	1.770	1.270
	662	.293	.102	1.078	.500
	677	.125	Trace.	.648	Trace.
Kittitas County	722	.471	.112	1.190	.793
	723	.462	.063	2.134	.850
	751	.794	.187	14.912	4.830
Klickitat County	8	.359	.150	.663	.385
	9	.413	.184	.390	.416
	190	.147	.069	.365	.354
	512	.028	.032	.790	Trace.
	1025	.116	.067	.550	....
Skamania County	661	.385	.138	.540	.297
	1102	.318	.118	.452	....
Clarke County	172	.166	.243	.486	.547
	330	.066	.198	.200	....
	331	9.178	.426	.862	.674
Wahkiakum County	602	.354	.212	.552	.228
	603	.610	.105	1.542	.982
	604	.134	.062	.145	....
Lewis County	783	.071	.062	.653	.405
	784	.162	.297	.769	.455
	785	.224	.107	.479	.086
	786	.124	.062	.421	.189
	1772	.184	.182	.164	.428
Chehalis County	143	.223	.118	.379	.256
	144	.144	.390	.393	.713
Mason County	869	.146	.155	1.525	.657
	1656	.440	.192	1.338	.703
	1657	.495	.192	1.433	.659
	1658	.475	.224	1.329	.465
	1659	.545	.224	2.099	1.411
	1660	.535	.216	1.418	.973
	1661	.940	.224	1.428	.947
	1662	.700	.224	1.449	.991
San Juan County	394	.151	.300	.873	.906
	870	.180	.125	1.060	.630
	871	.162	.087	1.031	.481
King County	159	.126	.044	.615	.807
	160	.157	.073	.693	.548
	499	.125	.266	1.089	.398
	500	.153	.190	1.089	.658
	744	.192	.124	1.321	.602
Dakota: [a]					
Prairie soils	6	.720	.112	.848	.868
	16	.725	.112	.852	1.535
	7	.745	.224	3.898	2.007

[a] Bul. 10, Div. of Chemistry, U. S. Dept. Agr. (1886) (locality unknown).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Michigan:[a]		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Berrien County	2550	0.180	0.715	0.967	0.267
Indiana:[a]					
Boone County	2551	.510	.041	1.387	.771
New York:[a]					
Oswego County	A1	.320	.023	.350	.389
	A2	.425	.052	.440	.501
	A3	.305	.023	.350	.274
	A4	.595	.050	.564	.641
	B5	.400	.010	.753	.555
	B6	.475	.048	1.873	.868
	B7	.480	.038	.535	.642
	C8	.530	.176	.683	.793
	C9	.460	.176	.634	.746
Louisiana:[a]					
Rapides Parish	2574	1.470	.160	1.165	2.169
	2575	.930	.144	2.060	1.066
	2576	1.940	.193	.836	2.547
	2577	.805	.113	.414	1.131
	2579	.430	.097	.185	.346
	2580	.165	.00	.111	.090
	2581	.745	.080	.371	.839
	2582	.805	.096	.926	1.934
Nebraska:[b]					
Dawes County		.041	.822	1.892	.205
Cherry County		.410	.062	.498	.084
Brown County		.741	.062	.773	.060
Antelope County		.592	.039	.595	.031
Saunders County		.241	.112	.490	.334
Lancaster County		.197	1.421	.612	.420
Hamilton County		.054	.094	.468	.439
Mills farm		.806	.137	1.007	1.080
Division B		.593	.156	.715	.860
Wisconsin:[c]					
Experiment plat—					
Poor		.26	.18	1.44	
Medium		.27	.20	1.35	
Good		.30	.22	1.05	
Douglas County	127	1.27	.08	.75	2.08
Clark County	61	.08	.17	.63	.73
University farm	119	.37	.13	.53	.80
Shiocton	71	.17	.27	.83	.56
Lac du Flambeau	48	1.81	.18	1.05	.57
Peat	21	.46	.25	1.74	.44
Muck	22	1.43	.23	1.82	1.47
Texas:[d]					
Terrell		.17	.28	.55	.28
Forney		.316	.326	11.00	.543
Prairie soil		.837	.313	6.62	.81
Manor, Travis County		.576	.115	5.81	.317
Bell County, Waxie		.22	.12	23.98	.94
Bell County, Hammock		1.45	.18	1.03	.73
Waxahachie	I	.35	.15	5.17	.67
New Braunfels	II	.22	.41	7.32	1.31
Abilene		11.37	Trace.	4.04	1.40
Wichita		.426	Trace.	.74	Trace.
El Paso		.52	.34	.57	
Do		.43	.60	3.83	Trace.
Fort Bend		.46	.166	2.74	.24
Brazoria		1.091	.136	1.66	.126
Do		.885	.34	5.66	1.85
Do		.545	Trace.	.600	.73
Kaufman County		.68	.25	6.30	.46
Pecan Gap		.83	.128	.814	.32
Cherokee		.48	.243	.555	.126
Ridge soil		Trace.	.07	.16	Trace.
Pine Ridge		Trace.	Trace.	.00	.00
Tyler County		.06	.03	.44	.08
Do		Trace.	Trace.	.00	.08
Do		1.14	Trace.	4.04	1.41
Wichita County		.426	Trace.	.07	Trace.
College Clay		.80	.083	.60	.55

[a] Bul. 10, Div. of Chemistry, U. S. Dept. Agr. (1886).
[b] Buls. 38 and 60, Nebr. Agr. Expt. Sta., (1894, 1899).
[c] Ann. Rep. Wis. Agr. Expt. Sta., 1905.
[a] Buls. 25, 35, 43, 61, 82, and 99, Texas Agr. Expt. Sta.; Ann. Rep. Texas Agr. Expt. Sta. 1889.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Texas—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Alvin	1	0.093	0.024	0.958	0.464
	2	.46	.22	6.33	1.46
	3	.56	.15	8.17	2.01
Harris County		.17	.12	1.62	
Hitchcock	1		.04	.21	.695
	2		.035	.165	Trace.
	3		.037	.40	.08
	4		.019	.66	.122
Mesa		.397	.074	3.56	1.06
Beeville	1	.32	.04	.76	.47
	2	Trace.	.01	.67	.41
	3	Trace.	.06	.60	.13
Carson's farm	14	.02	.04	.17	.09
	16	.05	.05	.08	.05
	18	.01	.008	.04	.08
Huntsville	1	.05	.07	.09	.08
	2	.06	.06	.07	.18
	3	.05	.07	.18	.18
Willis	1	Trace.	.01	.18	.14
	4	.06	.01	.20	.27
	5	.37	.04	.16	.18
	7	.01	.03	.16	.28
	9	.04	.01	.04	.09
	11	.05	.29	.06	.18
Rice soils	95	.08	.016	.24	.18
	96	.29	.036	.55	.50
	97	.137	.019	.53	.70
	137	.143	.026	.24	.26
	141	.06	.023	.09	.16
	206	.396	.025	2.17	.83
Harris County		.29	.156	.65	.27
Victoria County		.43	.093	1.05	1.09
Brazoria County		.78	.148	1.88	1.91
Brownsville		1.31	.204	14.43	1.53
Houston County—					
Norfolk sand		.10	.01	.28	.31
Fine sand		.13	.01	.10	.03
Fine sandy loam		.18	.02	.09	.11
Orangeburg fine sand		.14	.05	.14	.06
Fine sandy loam		.71	.05	.10	.08
Lufkin fine sand		.11	.03	.15	.63
Clay		.14	.01	.43	.07
Susquehanna fine sandy loam		.11	.03	.05	.09
Clay		.20	.02	.29	.29
Anderson County—					
Norfolk sand		.07	.02	.05	.05
Fine sand		.10	.02	.06	.07
Fine sandy loam		.13	.01	.04	.05
Orangeburg fine sandy loam		.13	.03	.02	.04
Clay		.22	.06	.23	.22
Yazoo clay		.50	.14	3.14	.75
Lamar County—					
Orangeburg sandy loam		.25	.05	.12	.07
Fine sandy loam		.76	.02	.06	.07
Silt		.78	.12	1.52	.61
Clay		.40	.05	.08	.20
Houston black clay		.39	.05	1.05	.89
Clay		.19	.02	.35	.32
Sharkey clay		.83	.11	1.20	1.25
Lufkin clay		.13	.03	.07	.11
Sanders loam		.12	.04	.38	.25
Travis County—					
Houston black clay		.29	.07	5.66	.68
Yazoo sandy loam		.28	.07	10.60	1.06
Travis gravelly loam		.52	.04	1.47	.16
Lufkin fine sandy loam		.11	.02	.91	.10
Bexar County—					
Norfolk sand		.05	.02	.04	.02
Sandy loam		.17	.02	.05	.14
Houston black loam		.80	.06	3.06	.73
Clay		.32	.08	1.16	1.83
Orangeburg fine sand		.25	.02	.18	.01
Clay		.45	.09	.35	.35
Portsmouth sandy loam		.23	.03	3.40	.37
San Antonio clay loam		.47	.08	8.06	4.01
Austin fine sandy loam		.03	.11	23.64	.62

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Texas—Continued.					
Hays County—		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Houston loam		0.29	0.01	0.37	0.23
Black clay		.20	.08	19.61	.62
Clay		.04	.09	19.32	.44
Crawford stony clay		.58	.18	12.40	.30
Silt clay		.78	.10	1.58	.83
Blanco loam		.05	.12	34.91	.91
Susquehanna fine sandy loam		.34	.04	.70	.20
Wabash clay		.41	.15	9.86	.96
Rio Grande Valley	1		.12	3.53	Trace.
	2		.29	3.68	.15
	3		.36	3.79	Trace.
Arkansas [a]	14727	.17	.07	.10	.14
	14728	.36	.10	.08	.29
	14729	.15	.07	.10	.20
	14730	.34	Trace.	.07	.22
	15353	.22	.16	.15	
	15354	.30	.09	.08	
California [a]	6356	1.07	.37	1.49	2.97
	6359	1.12	.53	1.47	3.39
	6831	.09	.05	.26	.21
	7936	.40	.16	4.46	1.75
	8051	1.81	.07	1.36	
	8063	1.52	.05	1.06	
	10147	.72	.14	.66	1.00
	3432	.33	.05	1.20	1.74
	6621	.92	.25	1.98	1.89
	6035	.11	.03	.67	.90
	6330	1.13	.30	1.29	2.22
	6352	1.84	.23	1.34	2.52
	124c	.55		2.82	1.18
	240c	.31		2.20	1.53
	241c	.54		1.96	1.73
	17958	.29	.06		
	17962	.48	.06	1.79	
	17968	.34	.03		
	17974	1.20	.21	1.92	
	17980	1.01	.09	1.61	
Colorado [a]	7962	.52	.22	4.26	1.13
	7964	.61	.26	5.49	1.09
	723a	.71	.36	1.13	
Miscellaneous	17177	.88	.06	5.14	.60
	17178	.57	.09	1.52	.19
	17180	.89	.13	2.54	.45
	17182	.82	.08	4.05	.20
	17184	.80	.11	2.03	.28
	17185	.79	.12	2.23	.21
	17186	1.27	.22	2.10	.23
	17190	.68	.22	.63	.48
	17193	1.02	.22	2.74	.62
	17195	.72	.11	.80	.13
	17196	.61	.15	.40	.62
	17197	.81	.22	.54	.19
	17198	.89	.35	3.60	.80
	17199	.54	.30	6.00	.36
	17201	.56	.24	.45	.40
District of Columbia [a]	6548	.53	.07	.57	.19
	726a	.29	.07	.26	.02
	727a	.49	.14	.46	.02
	728a	.36	.05	.26	.01
Florida [a]	2822	.04	.93	.24	.07
	3965	.03		.03	.16
	5284	.20	.02	.10	.07
	5286	.17	.08	.12	.05
	5288	.18	.02	.07	.06
	5290	.19	.03	.15	.07
	5391	.04	.05	.12	.01
	5392	.05	.04	.08	.02
	5403	.06	.04	.05	.01
	5404	.07	.06	.02	.02
	5405	.07	.04	.06	.01
	5406	.09	.09	.04	.03
	5407	.11	.19	.07	.08
	5408	.07	.17	.15	.02
	5409	.08	.08	.21	.02
	5410	.10	.08	.05	.03
	5413	.09	.06	.12	.01
	5414	.05	.04	.09	.02

[a] Analyses made by the Bureau of Soils, U. S. Dept. of Agr.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Georgia[a]	6263	0.16	0.12	0.16	0.18
	6364	.09	.05	.09	.12
Kansas[a]	1217aA	.18	.09	Trace.	....
	1217aB	.54	.10	2.84	.66
	1217aC	.26	.11	Trace.	.36
	1217aD	.70	.13	3.23	.62
	5299	.53	.11	.17	....
Kentucky[a]	7565	.28	.03	.05	.08
	13715	.39	.05	.24	.40
	13716	.31	.05	.24	.43
	13717	.23	.05	.29	.37
	13718	.26	.04	.23	.41
	1059a	1.06	.25	.23	.51
Louisiana[a]	733	.71	.19	.54	....
	734	.76	.18	.66	....
Maryland[a]	132	.41	....	.44	.69
	5460	.38	.08	.21	.34
	5459	.91	.11	.11	.18
	5456	.44	.10	.11	.47
	5455	.89	.05	.15	.40
	5454	.86	.09	.14	.14
	1099	.46	.20	1.26	....
	749a	.15	.04	.09	....
	864a	.08	.04	.09	.03
Minnesota[a]	15355	.73	.24	6.45	....
	15356	.63	.17	13.83	....
	15357	.15	.24	1.22	....
	15358	.15	.15	1.07	....
	15359	.14	.23	1.03	....
	15360	.17	.13	.60	....
Mississippi[a]	7935	.31	.24	.83	1.22
Nebraska[a]	17205	.91	.19	2.35	1.22
	17208	.96	.26	1.95	.42
	17214	.99	.26	3.07	.65
	17221	.54	.29	2.35	.47
	2809	.10	.30	.24	.03
	6832	.08	.02	.19	.09
New Jersey[a]	1242a	1.20	.28	.24	....
	5685	1.09	1.25	1.27	3.23
Nevada[a]	17990	72	.12	1.45	1.23
	17993	.69	.20	1.81	1.60
	17996	.99	.17	1.86	1.42
	17999	.66	.20	1.56	1.31
	18002	1.07	.16	1.78	1.48
	18005	.73	.15	1.70	1.21
	18008	.92	.21	1.80	1.51
North Dakota[a]	6549	.92	.10	.92	1.37
Pennsylvania[a]	1119a	.35	.16	.08	....
		.30	.17	.09	....
State College	1283a	.46	.12	.31	.54
	1266a	.40	.11	.26	.47
	1268a	.47	.11	.23	.46
	1270a	.42	.12	.25	.41
	1273a	.47	.11	.25	.42
	1274a	.40	.01	.25	.45
	1276a	.44	.03	.26	.55
	1278a	.44	.13	.24	.52
	1280a	.26	.11	.33	.44
	1282a	.35	.16	.34	.43
	1284a	.49	.13	.29	.56
	1265a	.43	.11	.25	.55
	1267a	.38	.11	.23	.42
	1269a	.41	.12	.24	.45
	1271a	.42	.11	.24	.50
	1272a	.39	.14	.27	.50
	1275a	.40	.11	.26	.53
	1277a	.38	.13	.23	.49
	1279a	.30	.15	.36	.47
	1281a	.26	.12	.31	.38
South Carolina[a]	3961	.02	.76	.59	.26
Texas[a]	2165	.13	.02	.07	.06
	2167	.08	.02	.15	.16
	805a	.06	.03	.22	.09
		.02	.02	.27	.09
	790a	.82	....	7.25	1.17
	12481	1.64	.14	2.67	....
	12482	1.20	.10	6.88	....

[a] Analyses made by the Bureau of Soils, U. S. Dept. of Agr.

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Virginia[a]	1295a	1.02	0.16	0.14	....
	4004	.06	.30	.09	0.18
Washington[a]	6546	.57	.11	1.11	1.01
Wisconsin[a]	798a	1.51	.05	.37	....
California:[b]					
Eldorado County	1638	.55	.23	.52	.38
Stanislaus County	1901	.98	.05	.61	.51
	1900	.49	.05	.44	.34
Tulare County	1903	.97	.15	.79	1.22
	1904	.87	.05	.73	.64
Ventura County	1910	.84	.14	.74	1.27
Los Angeles County	1820	1.60	.31	2.73	2.87
	1908	.41	.23	1.95	2.04
	1906	1.18	.21	2.66	1.79
	1907	1.01	.15	2.49	1.75
Eldorado County	2214	.31	.15	.38	.69
Shasta County	2181	.40	.06	1.34	.67
Modoc County	2169	.41	.25	3 65	2.55
Glenn County	2291	.23	.22	1.53	.42
Yuba County	2403	.42	.20	.72	1.45
	2405	.42	.14	.97	1.83
Humboldt County	2319	.61	.30	.44	1.76
Mendocino County	2243	.95	.15	1.40	2.55
	2453	1.41	.28	1.09	2.35
Lake County	2301	.61	.08	2.51	1.37
	2295	.84	.12	2.34	.50
Contra Costa County	2454	.53	.07	4.50	1.83
Alameda County	1880	1.17	.19	1.38	2.68
	2430	.33	.07	.76	.76
San Luis Obispo County	2061	.67	.71	2.11	2.26
Ventura County	2273	.49	.06	.35	.89
Riverside County	2234	1.00	.16	1.50	1.64
San Diego County	1936	.18	.11	.47	.58
Riverside County	2470	.80	.14	2.69	.75
	2471	1.26	.21	2.71	2.20
San Diego County	2324	.76	.23	4.35	1.24
	2325	.74	.22	3.75	1.68
Florida,[c] Dade County	10	.0965	.0240	.0250	.0090
	14	.0043	.0240	.1275	.0612
	19	.0178	.0256	.0725	.0351
	18	Trace.	.0304	.5500	.0036
Lee County	1	.0164	2.5630	6.6050	.0290
	25	.0058	.0208	Trace.	.0299
	26	Trace.	.0496	.0725	.0198
	28	.0125	.0112	.0000	.0117
	59	.0024	.0128	.0700	.0261
De Soto County	4	.0212	.0160	.0750	.1125
	64	.0072	.0928	.0000	.0369
Brevard County	12	.0086	.0336	.2100	.0225
	13	.0111	.0192	.1075	.0099
	21	.0612	.0544	2.2325	.0207
	38	Trace.	.0416	.0400	.0090
	40	.0034	Trace.	.0000	.0634
	X	.0198	.0333	.1150	.0197
Osceola County	47	.0077	.0032	.0225	.0144
	49	.0073	.0096	.0150	.0252
	51	Trace.	.0144	.0600	.0234
Polk County	42	.0038	.0064	.0000	.0090
	43	Trace.	.2768	.0125	.0531
	44	Trace.	2.4000	.1125	.0990
	45	.0028	.2112	.0175	.0414
	55	Trace.	.0272	.0125	.0261
	57	Trace.	.0240	.0000	.0162
Hillsboro County	75	.0028	.3408	.2025	.0693
	116	.0023	.0880	.2650	.0072
Pasco County	73	.0048	.1360	.0250	.0405
Orange County	31	Trace.	.1328	.0275	.0369
	60	Trace.	.0816	.0000	.0270
	62	.0193	.0272	.0000	.0036
	Y	.0160	.1175	.0624	.0175
Volusia County	6	.0048	.0112	.0500	.0297
	8	.0164	.0577	.0225	.0279
	Z	.0208	.1660	.0526	.0145
Marion County	33	.0149	.2544	.1500	.0198

[a] Analyses made by the Bureau of Soils, U. S. Dept. of Agr.
[b] Ann. Rep. Cal. Agr. Expt. Sta., 1895–1897, 1901–1903.
[c] Buls. 43 and 68, Fla. Agr. Expt. Sta. (1897, 1903).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia MgO).
Florida—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Miami	1296	0.0135	0.0162	0.1740	0.0176
	1298	.0170	.0075	.1587	.0222
	1300	.0170	.0062	.0312	.0149
Boca Raton	1302	.0097	.0087	.0187	.0000
	1304	.0145	.0087	.0062	.0000
West Palm Beach	1306	.0140	.0087	.0087	.0000
	1308	.0048	.0100	.0037	.0000
	1310	.0097	.0087	.0062	.0062
	1312	.0145	.0137	.0287	.0158
Jensen	1314	.0061	.0120	.0000	.0095
	1316	.0073	.0056	.0112	.0049
	1318	.0061	.0087	.0087	.0058
Eldred	1320	.0110	.0431	.0862	.0511
	1322	.0134	.0106	.0137	.0000
St. Petersburg	1380	.0134	.0056	.0162	.0058
	1382	.0134	.0556	.0312	.0357
Oneco	1384	.0122	.0106	.0187	.0163
Punta Gorda	1386	.0170	.0187	.0850	.0171
	1388	.0110	.0050	.0475	.0144
Orlando	1390	.0158	.0250	.0350	.0432
Key	1411	.2963	.9459	4.7259	1.5758
Idaho:[a]					
Kootenai County	9	....	Trace.	1.32	.03
	20	....	.45	.94	1.16
Latah County	17	.59	.49	2.80	.51
	19	.61	1.57	.13	.19
Shoshone County	5	.04	.35	.78	.72
Nez Perce County	31	.034	.25	3.75	.91
Idaho County	13	.04	.62	1.49	2.52
	14	.40	.01	1.44	.34
	15	1.92	.01	.64	.22
Canyon County	1	....	.31	2.70	.58
	6	....	1.20	.69	1.60
	7	....	.09	Trace.	.57
	8	....	.19	.65	.38
Bingham County	21	1.16	1.39	.07	.31
	22	1.22	.47	2.59	.29
	23	1.28	.41	2.15	.14
	24	.99	1.16	2.08	1.25
	25	1.04	.21	.06	1.09
Bear Lake County	26	1.44	.31	1.43	.37
	27	.72	.19	3.94	3.15
	29	1.12	.05	.59	3.15
	30	.72	.94	5.92	1.24
Cassia County	4	.775	.183	1.971	1.387
	5	.695	.137	1.870	1.322
Cœur d'Alene	7	.440	.188	.533	1.290
	9	.467	.205	.432	1.527
Nez Perce County	11	.459	.188	.507	.905
American Ridge	12	.684	.157	.557	.997
Latah County	13	.673	.131	.722	1.019
	14	.557	.206	.767	.802
Lewiston	15	.526	.148	.872	1.150
Moscow	16	.563	.192	.939	.886
	18	.677	.176	.999	.766
Boise	20	.789	.237	1.567	1.090
	21	.896	.184	.893	1.006
	22	.459	.141	.465	.535
	23	.572	.143	.780	.831
Louisiana:[b]					
Calhoun	1	.023	.037	.085	.018
	2	.029	.048	.145	.074
	3	.011	.021	.027	.027
	5	.008	.011	.009	.011
Monroe	7	.069	.072	.128	.180
	9	.023	.007	.040	.036
Mississippi:[c]					
Agricultural College	48	.125	.148	.45	.32
	50	.153	.187	.43	.55
	49	.122	.092	.161	.12
	51	.126	.114	.307	.47
	52	.303	.204	.400	.68
	53	.104	.156	.770	.60
	54	.127	.233	.370	.47
	55	.132	.149	.610	.60

[a] Buls. 9 and 28, Idaho Agr. Expt. Sta. (1894, 1901).
[b] Special Rep. on the Geology and Agriculture of the Hills of La., Pt. I. La. Agr. Expt. Sta., 1892.
[c] Ann. Rep. Miss. Agr. Expt. Sta., 1895 and 1898-99; Bul. 65, Miss. Agr. Expt. Sta. (1900).

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Mississippi—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Agricultural College	56	0.117	0.182	0.440	0.60
	57	.097	.185	.64	.56
	58	.131	.102	.54	.39
	59	.150	.147	.83	.79
	60	.111	.096	.40	.53
	61	.145	.181	.63	.40
	62	.116	.118	.39	.12
	162	.12	.08	.14	.10
	163	.06	.08	.22	.06
Union County	606	.31	.089	.86	.061
Jackson County	692	.050	.027	.16	.072
	694	.056	.015	.23	.064
	695	.080	.004	.20	.028
Chickasaw County	888	.10	.26	.27	.22
Covington County	1522	.09	.184	.302	.318
	1523	.08	.100	.280	.126
Noxubee County	1524	.18	.24	4.91	.144
Oktibbeha County	1536	.25	.097	.47	.38
Tallahatchie County	1538	.46	.257	.94	.25
Hinds County	1544	.10	.07	.66	.36
Oktibbeha County	1572	.22	.192	1.85	.302
Holmes County	1696	.24	.190	.35	.08
Crystal Springs	928	.07	.07	.175	....
Coffeeville	400	.20	.09	.27	.24
	401	.18	.09	.22	.28
	402	.09	.06	.15	.17
	403	.17	.08	.19	.25
	404	.14	.06	.19	.19
Yazoo City	421	.365	.127	2.14	.11
Como	75	.143	.27	.88	.023
	76	.147	.232	.084	.033
Elizabeth	269	.55	.16	.34	.20
Oktibbeha County	617	.300	.144	1.88	....
	620	.280	.093	5.90	....
	621	.360	.262	1.03	....
	622	.210	.108	.380	....
	583	.380	.247	.315	....
	594	.200	.108	.230	....
	595	.420	.229	.190	....
	597	.165	.147	.32	....
	585	.460	.300	.630	....
Wilkinson County	1026	.166	.033	.080	....
Oktibbeha County	833	.337	.079	.185	....
Jones County	1013	.208	.024	.111	....
Kemper County	926	.076	.110	.192	....
	928	.465	.156	1.68	....
	929	.185	.072	.980	....
	931	.263	.053	.535	....
Noxubee County	932	.442	.188	.960	....
	933	.148	.084	.210	....
	935	.201	.090	.325	....
	937	.218	.085	.985	....
	939	.478	.189	.156	....
	940	.463	.121	.145	....
	941	.426	.121	1.130	....
	942	.400	.263	1.18	....
	943	.500	.302	15.57	....
	944	.509	.321	5.24	....
	945	.574	.296	5.15	....
	946	.450	.105	.945	....
	948	.360	.046	.990	....
	949	.372	.105	.485	....
	951	.245	.079	.325	....
Lowndes County	1153	.358	.111	3.56	....
	1154	.387	.140	3.71	....
	1155	.283	.093	.315	....
	1157	.268	.123	.360	....
Oktibbeha County	581	.39	.096	.11	....
	584	.92	.57	1.06	....
	586	.210	.115	.235	....
	593	.177	.14	.180	....
	622	.21	.106	.38	....
	1106	.491	.328	2.69	....
	1107	.470	.143	.265	....
	1108	.423	.274	2.25	....
	1117	.360	.086	.950	....
	1118	.480	.121	12.52	....
	1119	.181	.105	.117	....

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Mississippi—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Oktibbeha County	1121	0.152	0.097	0.175	....
	1122	.150	.083	.100	....
	1111	.215	.055	.800	....
	1113	.305	.070	1.06	....
	1280	.276	.075	.960	....
	1124	.454	.332	.260	....
	1126	.177	.119	170	....
	1114	.398	.114	1.20	....
	1115	.262	.080	.800	....
	1158	.331	.188	.940	....
Clay County	1159	.193	.051	.650	....
	1161	.395	.184	1.53	....
	1162	.369	.244	1.24	....
	1163	.302	.207	1.36	....
	1165	.258	.113	.430	....
Monroe County	1168	.502	.191	1.82	....
	1169	.364	.109	1.11	....
	1172	.401	.174	6.26	....
	1174	.208	.089	1.59	....
	1175	.370	.153	.680	....
Chickasaw County	1178	.305	.115	1.06	....
	1179	.198	.036	.615	....
	1180	.258	.054	.890	....
	1181	.402	.140	5.80	....
	1182	.135	.047	.160	....
	1274	.189	.056	.110	....
	1276	.262	.064	.150	....
Lee County	1184	.385	.160	1.20	....
	1185	.340	.134	.815	....
	1186	.321	.210	1.61	....
	1187	.216	.210	3.27	....
	1189	.297	.237	1.27	....
	1190	.395	.194	1.47	....
	1191	.157	.068	.235	....
	1193	.402	.185	.940	....
	1194	.269	.118	.470	....
	1200	.200	.083	.500	....
	1202	.250	.076	.340	....
	1204	.096	.032	.053	....
	1206	.179	.253	9.63	....
	1209	.129	.055	.160	....
	1213	.086	.025	.030	....
Prentiss County	1211	.220	.090	.510	....
	1217	.098	.036	.190	....
	1219	.103	.043	.120	....
	1221	.102	.065	.120	....
	1223	.321	.329	11.93	....
	1225	.226	.129	.810	....
	1227	.273	.174	.340	....
	1229	.105	.009	.070	....
	1234	.088	.018	.072	....
	1250	.089	.027	.205	....
	1253	.359	.092	1.32	....
	1254	.122	.051	.160	....
	1256	....	.114	1.05	....
	1257	.565	.140	.830	....
Alcorn County	1241	.147	.071	.235	....
	1245	.185	.051	.245	....
	1248	.157	.050	.140	....
Union County	1261	.276	.048	.190	....
	1263	.187	.035	.160	....
	1265	.170	.038	.190	....
	1266	.203	.052	.140	....
	1268	.258	.093	.205	....
	1030	.190	.024	.110	....
Pontotoc County	1269	.336	.167	.142	....
	1272	.333	.094	.106	....
Alcorn County	1236	.178	.072	.145	....
Madison County	625	.215	.062	.29	....
	629	.20	.076	.22	....
	633	.170	.083	.17	....
	879	.250	.061	.120	....
	881	.257	.040	.165	....
	883	.396	.068	.145	....
	884	.180	.042	.145	....
	876	.326	.022	.300	....
	886	.225	.039	.265	....

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Mississippi—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Leake County	890	0.281	0.018	0.110	....
	892	.160	.019	.110	....
	894	.165	.022	.025	....
	895	.093	.016	.05	....
Attala County	897	.190	.030	.115	....
	898	.229	.044	.210	....
	900	.160	.047	.130	....
	902	.105	.013	.050	....
Choctaw County	904	.246	.075	.160	....
	905	.177	.024	.050	....
	906	.197	.037	.105	....
Carroll County	958	.363	.080	.120	....
	960	.276	.188	.135	....
	961	.222	.104	.160	....
	963	.298	.051	.100	....
	965	.408	.078	.110	....
	967	.436	.090	.120	....
	969	.170	.050	.125	....
Yalobusha County	971	.180	.023	.015	....
	973	.311	.044	.065	....
	974	.212	.053	.140	....
	975	.223	.063	.145	....
Panola County	976	.293	.102	.170	....
	977	.335	.168	.260	....
	978	.333	.117	.130	....
	979	.323	.070	.190	....
	981	.426	.064	.170	....
	983	.322	.064	.125	....
	985	.373	.089	.185	....
	988	.304	.135	.120	....
Tate County	991	.183	.066	.190	....
	994	.241	.055	.140	....
	996	.262	.064	.220	....
	997	.303	.071	.165	....
	1000	.43	.097	.050	....
	1001	.26	.069	.150	....
Marshall County	1003	.253	.041	.300	....
	1007	.360	.083	.225	....
	1008	.252	.079	.275	....
Amite County	1021	.125	.055	.095	....
	1023	.17	.067	.175	....
	1025	.242	.057	.125	....
	1026	.166	.033	.08	....
Hinds County	871	.168	.040	.190	....
	873	.182	.057	.210	....
	875	.277	.050	.105	....
Neshoba County	834	.170	.052	.075	....
	836	.247	.087	.165	....
	838	.163	.045	.080	....
Scott County	853	.270	.097	.235	....
	855	.210	.044	.10	....
	856	.309	.058	.20	....
	848	.190	.025	.095	....
	849	.202	.066	.285	....
	850	.150	.049	.135	....
Leake County	844	.189	.050	.205	....
	846	.165	.038	.170	....
Scott County	852	.130	.082	.085	....
Neshoba County	954	.563	.117	.360	....
Copiah County	801	.203	.064	.15	....
	803	.223	.058	.075	....
	805	.297	.064	.175	....
	807	.190	.061	.175	....
	809	.170	.040	.140	....
	810	.286	.047	.145	....
	811	.263	.068	1.20	....
	813	.173	.05	.070	....
	816	.300	.107	.255	....
	818	.196	.149	.225	....
	820	.233	.081	.215	....
	822	.200	.040	.155	....
	823	.277	.065	.120	....
	824	.253	.050	.285	....
	825	.251	.060	.100	....
	826	.262	.077	.150	....
	827	.128	.064	.095	....
	828	.134	.047	.115	....
	830	.199	.060	.130	....
	831	.264	.064	.125	....

Chemical composition of the soils of the United States—Continued.

State or Territory.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Mississippi—Continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Jones County	832	0.132	0.036	0.125	....
	1010	.123	.046	.20	....
	1012	.160	.035	.15	....
Harrison County	674	.098	.033	.18	....
Winston County	913	.160	.044	.155	....
	915	.145	.055	.160	....
Kemper County	917	.140	.074	.068	....
	919	.199	.060	.130	....
Winston County	911	.133	.022	.100	....
Neshoba County	921	.090	.028	.020	....
Kemper County	923	.141	.019	.070	....
	925	.345	.029	.170	....
Scott County	858	.129	.013	.195	....
	859	.255	.029	.725	....
Rankin County	861	.290	.052	.220	....
	862	.194	.040	.185	....
	864	.240	.080	.115	....
	865	.230	.097	.125	....
	867	.193	.062	.125	....
	869	.115	.057	.15	....
Washington County	269	.55	.16	.34	....
Bolivar County	676	.46	.17	.126	....
	677	6.87	.192	.92	....
	678	6.92	.195	.89	....
	679	.941	.216	.97	....
Coahoma County	700	.54	.092	.40	....
	701	.54	.14	.41	....
	702	.84	.134	.59	....
	703	.36	.115	.34	....
Jasper County	658	.415	.118	.372	....
	659	.50	.109	.245	....

ALABAMA.—Four samples have been reported upon from this State, the range in composition being for potash 0.149 to 0.903 per cent, phosphoric acid 0.017 to 0.15 per cent, lime 0.039 to 0.289 per cent, and magnesia 0.01 to 0.633 per cent.

ARIZONA.—Twenty-two samples have been reported upon from this State, the range in composition being for potash 0.472 to 1.959 per cent, for phosphoric acid 0.031 to 0.244 per cent, lime 0.579 to 8.67 per cent, and magnesia 0.66 to 3.086 per cent.

ARKANSAS.—Six samples have been reported upon from this State, the range in composition being for potash 0.15 to 0.36 per cent, phosphoric acid 0.07 to 0.16 per cent, lime 0.07 to 0.15 per cent, and magnesia 0.14 to 0.29 per cent.

CALIFORNIA.—One hundred and fifteen samples have been reported upon from this State, the range in composition being for potash 0.09 to 1.84 per cent, phosphoric acid 0.02 to 0.71 per cent, lime 0.113 to 13.94 per cent, and magnesia 0.16 to 16.97 per cent.

COLORADO.—Twenty-nine samples have been reported upon from this State, the range in composition being for potash 0.14 to 1.27 per cent, for phosphoric acid 0.06 to 0.36 per cent, lime 0.40 to 6.00 per cent, and magnesia 0.13 to 1.61 per cent.

CONNECTICUT.—Only one sample has been reported upon from this State, containing 0.23 per cent potash, 0.22 per cent phosphoric acid, 0.32 per cent lime, and 0.78 per cent magnesia.

District of Columbia.—Four samples have been reported upon from the District of Columbia, the range in composition being for potash 0.29 to 0.53 per cent, phosphoric acid 0.05 to 0.14 per cent, lime 0.26 to 0.57 per cent, and magnesia 0.01 to 0.19 per cent.

Florida.—Eighty-eight samples have been reported upon from this State, the range in composition being for potash 0.0023 to 0.2963 per cent, phosphoric acid 0.0032 to 2.563 per cent, lime 0.0037 to 7.60 per cent, and magnesia 0.001 to 1.5758 per cent.

Georgia.—Two samples have been reported upon from this State, the range in composition being for potash 0.09 to 0.16 per cent, phosphoric acid 0.05 to 0.12 per cent, lime 0.09 to 0.16 per cent, and magnesia 0.12 to 0.16 per cent.

Idaho.—Thirty-seven samples have been reported upon from this State, the range in composition being for potash 0.034 to 1.92 per cent, phosphoric acid 0.01 to 1.57 per cent, lime 0.06 to 5.92 per cent, and magnesia 0.03 to 3.15 per cent.

Illinois.—Five samples have been reported upon from this State, the range in composition being for potash 0.156 to 0.580 per cent, phosphoric acid 0.066 to 0.185 per cent, lime 0.21 to 1.455 per cent, and magnesia 0.218 to 0.989 per cent.

Indiana.—Thirteen samples have been reported upon from this State, the range in composition being for potash 0.181 to 0.68 per cent, phosphoric acid 0.041 to 1.01 per cent, lime 0.37 to 1.387 per cent, and magnesia 0.45 to 0.771 per cent.

Iowa.—Two samples have been reported upon from this State, the range in composition being for potash 0.337 to 0.365 per cent, phosphoric acid 0.093 to 0.137 per cent, lime 0.790 to 1.185 per cent, and magnesia 0.585 to 0.662 per cent.

Kansas.—Seven samples have been reported upon from this State, the range in composition being for potash 0.18 to 0.766 per cent, phosphoric acid 0.089 to 0.13 per cent, lime 0.17 to 3.23 per cent, and magnesia 0.36 to 0.66 per cent.

Kentucky.—Ninety-two samples have been reported upon from this State, the range in composition being for potash 0.09 to 1.06 per cent, phosphoric acid 0.015 to 1.755, lime 0.05 to 1.725, and magnesia 0.08 to 0.52 per cent.

Louisiana.—Eighteen samples have been reported upon from this State, the range in composition being for potash 0.008 to 1.94 per cent, phosphoric acid 0.007 to 0.193 per cent, lime 0.009 to 2.06 per cent, and magnesia 0.011 to 2.547 per cent.

Maine.—Only one sample has been reported upon from this State, containing 0.14 per cent potash, and 0.17 per cent phosphoric acid.

Maryland.—Fourteen samples have been reported upon from this State, the range in composition being for potash 0.08 to 0.91 per cent,

phosphoric acid 0.04 to 0.50 per cent, lime 0.09 to 1.26 per cent, and magnesia 0.03 to 0.69 per cent.

MASSACHUSETTS.—Only one sample has been reported upon from this State, containing 0.153 per cent potash, 0.144 per cent phosphoric acid, 0.525 per cent lime, and 0.558 per cent magnesia.

MICHIGAN.—Forty samples have been reported upon from this State, the range in composition being for potash 0.118 to 2.12 per cent, phosphoric acid 0.01 to 0.88 per cent, lime 0.20 to 6.09 per cent, and magnesia 0.12 to 1.59 per cent.

MINNESOTA.—One hundred and sixty-six samples have been reported upon from this State, the range in composition being for potash 0.08 to 1.16 per cent, phosphoric acid 0.04 to 2.61 per cent, lime 0.11 to 14.0 per cent, and magnesia 0.10 to 6.12 per cent.

MISSISSIPPI.—Two hundred and seventy-six samples have been reported upon from this State, the range in composition being for potash 0.05 to 6.92 per cent, phosphoric acid 0.004 to 0.57 per cent, lime 0.015 to 15.57 per cent, and magnesia 0.023 to 1.22 per cent.

MISSOURI.—Eight samples have been reported upon from this State, the range in composition being for potash 0.272 to 2.57 per cent, phosphoric acid 0.06 to 0.121 per cent, lime 0.405 to 0.630 per cent, and magnesia 0.21 to 0.55 per cent.

MONTANA.—Two samples have been reported upon from this State, the range in composition being for potash 0.731 to 0.747 per cent, phosphoric acid 0.176 to 0.185 per cent, lime 0.87 to 0.97 per cent, and magnesia 0.907 to 1.105 per cent.

NEBRASKA.—Fifteen samples have been reported upon from this State, the range in composition being for potash 0.041 to 0.99 per cent, phosphoric acid 0.02 to 1.421 per cent, lime 0.19 to 3.07 per cent, and magnesia 0.03 to 1.22 per cent.

NEVADA.—Forty-eight samples have been reported upon from this State, the range in composition being for potash 0.016 to 3.34 per cent, phosphoric acid 0.019 to 2.292 per cent, lime 0.80 to 17.831 per cent, and magnesia 0.17 to 8.404 per cent.

NEW HAMPSHIRE.—Five samples have been reported upon from this State, the range in composition being for potash 0.64 to 1.06 per cent, phosphoric acid 0.05 to 0.36 per cent, lime 0.63 to 0.77 per cent, and magnesia 0.53 to 0.74 per cent.

NEW JERSEY.—Two samples have been reported upon from this State, the range in composition being for potash 1.09 to 1.20 per cent, phosphoric acid 0.28 to 1.25 per cent, and lime 0.24 to 1.27 per cent.

NEW YORK.—Sixteen samples have been reported upon from this State, the range in composition being for potash 0.246 to 1.04 per cent, phosphoric acid 0.01 to 0.202 per cent, lime 0.125 to 1.873 per cent, and magnesia 0.274 to 1.94 per cent.

North Carolina.—Two samples have been reported upon from this State, the range in composition being for potash 0.02 to 0.161 per cent, phosphoric acid 0.016 to 0.02 per cent, lime 0.07 to 0.24 per cent, and magnesia 0.02 to 0.047 per cent.

North Dakota.—Twenty-five samples have been reported upon from this State, the range in composition being for potash 0.18 to 0.96 per cent, phosphoric acid 0.10 to 0.40 per cent, lime 0.32 to 14.67 per cent, and magnesia 0.07 to 1.37 per cent.

Ohio.—Fifty-seven samples have been reported upon from this State, the range in composition being for potash 0.04 to 0.64 per cent, phosphoric acid 0.064 to 0.80 per cent, lime 0.07 to 0.68 per cent, and magnesia 0.09 to 0.76 per cent.

Oklahoma.—Three samples have been reported upon from this State, the range in composition being for potash 0.32 to 0.80 per cent, phosphoric acid 0.04 to 0.06 per cent, lime 0.44 to 0.95 per cent, and magnesia 0.16 to 0.21 per cent.

Oregon.—One hundred and thirty-six samples have been reported upon from this State, the range in composition being for potash 0.02 to 1.85 per cent, phosphoric acid 0.01 to 2.30 per cent, lime 0.10 to 14.36 per cent, and magnesia 0.01 to 3.36 per cent.

Pennsylvania.—Twenty-four samples have been reported upon from this State, the range in composition being for potash 0.26 to 0.67 per cent, phosphoric acid 0.01 to 0.265, lime 0.08 to 0.61, and magnesia 0.38 to 2.05 per cent.

Rhode Island.—Seven samples have been reported upon from this State, the range in composition being for potash 0.124 to 0.184 per cent, phosphoric acid 0.029 to 0.127 per cent, lime 0.252 to 1.295 per cent, and magnesia 0.209 to 1.141 per cent.

South Carolina.—Eleven samples have been reported upon from this State, the range in composition being for potash 0.02 to 0.541 per cent, phosphoric acid 0.011 to 0.76 per cent, lime 0.019 to 0.59 per cent, and magnesia 0.003 to 0.811 per cent.

South Dakota.—Two samples have been reported upon from this State, the range in composition being for potash 0.365 to 0.39 per cent, phosphoric acid 0.147 to 0.153 per cent, lime 0.665 to 0.710 per cent, and magnesia 0.585 to 0.628 per cent.

Tennessee.—One hundred and forty-four samples have been reported upon from this State, the range in composition being for potash 0.06 to 0.91 per cent, phosphoric acid 0.01 to 1.70 per cent, lime 0.02 to 2.25 per cent, and magnesia 0.085 to 0.96 per cent.

Texas.—One hundred and seventeen samples have been reported upon from this State, the range in composition being for potash 0.01 to 11.37 per cent, phosphoric acid 0.008 to 0.60 per cent, lime 0.02 to 34.91 per cent, and magnesia 0.01 to 4.01 per cent.

Utah.—Fifty-five samples have been reported upon from this State, the range in composition being for potash 0.046 to 2.69 per cent, phosphoric acid 0.103 to 0.42 per cent, lime 0.37 to 22.54 per cent, and magnesia 0.07 to 2.52 per cent.

Virginia.—Two samples have been reported upon from this State, the range in composition being for potash 0.06 to 1.02 per cent, phosphoric acid 0.16 to 0.30 per cent, and lime 0.09 to 0.14 per cent.

Washington.—One hundred and ninety-four samples have been reported upon from this State, the range in composition being for potash 0.003 to 9.178 per cent, phosphoric acid 0.019 to 0.543 per cent, lime 0.005 to 36.009 per cent, and magnesia 0.005 to 4.83 per cent.

West Virginia.—Fourteen samples have been reported upon from this State, the range in composition being for potash 0.243 to 0.888 per cent, phosphoric acid 0.088 to 0.211 per cent, and lime 0.055 to 0.451 per cent.

Wisconsin.—Thirteen samples have been reported upon from this State, the range in composition being for potash 0.08 to 1.81 per cent, phosphoric acid 0.05 to 0.27 per cent, lime 0.37 to 1.82 per cent, and magnesia 0.412 to 2.08 per cent.

Wyoming.—Nine samples have been reported upon from this State, the range in composition being for potash 0.52 to 0.73 per cent, phosphoric acid 0.12 to 0.28 per cent, lime 0.64 to 6.63 per cent, and magnesia 0.14 to 3.21 per cent.

Chemical composition of the soils of Great Britain and Ireland.

ENGLAND.

County.	Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
			Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Dorset [a]	Alluvium	38	0.46	0.42	3.84	0.48
		62	.22	.23	1.31	.11
		41	.81	.46	1.09	.26
	Gravel	36	.22	.32	.71	.45
		37	.33	.28	.64	.27
		63	.18	.26	.11	.04
		64	.17	.20	.10	.05
	Bagshot beds	83	.19	.18	.37	.02
		30	.13	.25	1.43	.34
		40	.18	.20	.80	.17
		65	.13	.12	.08	.06
	London clay	80	.23	.32	.37	.12
		12	.22	.47	1.26	.31
		68	.20	.15	.36	.07
	Reading beds	81	.27	.33	.66	.27
		11	.27	.40	1.57	.68
		67	.24	.21	.65	.07
		61	.06	.11	.33	.02
	Junction Reading beds and chalk.	39	.24	.42	1.80	.27
	Chalk	15	.25	.30	41.00	.83
		71	.27	.29	38.78	.65
		99	.19	.78	31.50	.53
		95	.29	.47	31.05	.11

[a] Fifth Annual Report on the Soils of Dorset, University College, Reading, 1903. In the original paper the results are expressed as lime carbonate and lime other than carbonate; these have been recalculated to give CaO content.

Chemical composition of the soils of Great Britain and Ireland—Continued.

ENGLAND—Continued.

County.	Description and locality.	Original sample No.	Potash (K_2O.)	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
			Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Dorset	Chalk	51	0.20	0.33	31.90	0.27
		94	.22	.49	14.22	.15
		35	.28	.24	5.69	.71
		50	.39	.36	35.60	.27
		16	.59	.33	33.40	.71
		72	.50	.27	9.48	.43
		49	.20	.31	2.09	.19
		21	.39	.25	1.71	.39
		100	.38	.51	1.38	.47
		1	.17	.44	.88	.41
		98	.47	.36	.98	.39
		96	.42	.31	1.30	.06
		97	.57	.26	.34	.28
	Greensand	79	.35	.37	.43	.08
		47	.81	.60	.92	.46
		48	.74	.79	7.12	1.00
		2	.40	.23	2.18	.59
	Junction greensand and marlstone.	31	.27	.32	1.55	.27
		25	.29	.28	.85	.68
	Wealden beds	33	.31	.31	1.01	.41
		32	.25	.44	1.36	.34
		84	.24	.29	.65	.32
		69	.36	.28	.96	.11
		22	.31	.50	.92	.37
	Purbeck beds	27	.34	.29	1.82	.48
	Portland stone	66	.46	.43	.51	.07
	Kimmeridge clay	3	.30	.15	2.10	.55
		20	.4	.6	2.10	.50
		42	.47	.89	2.23	.09
		85	.61	.38	2.47	.43
		86	.81	.24	1.87	.51
		87	.95	.34	1.76	.42
		88	.92	.50	1.18	.51
	Coral rag	19	.38	.31	.67	.96
		77	.63	.32	6.34	.54
		82	.39	.47	10.53	.53
		89	.53	.60	18.75	.60
		8	.27	.40	26.75	.36
		57	.68	.35	2.03	.69
		58	.49	.32	12.09	.20
	Calcareous grit	9	.25	.31	.80	.63
	Oxford clay	73	.79	.38	1.88	.21
		34	.21	.38	.81	.55
		60	.91	.34	2.04	.47
		59	.53	.23	.60	.35
		52	.73	.33	1.70	.50
		53	.49	.32	.59	.25
		29	.34	.25	.60	.32
		4	.46	.45	2.99	.38
	Cornbrash	10	.26	.49	3.16	.64
		76	.50	.45	6.29	.22
		28	.23	.29	6.88	.46
	Fuller's earth	18	.41	.45	.99	1.06
		23	.17	.26	.77	.57
		56	.66	.27	.91	.35
		46	.89	.30	1.09	.53
		90	.80	.31	4.50	.82
		26	.53	.17	8.28	.01
	Inferior oolite	91	.52	.64	4.80	.93
		13	.50	.37	11.64	.29
	Junction inferior oolite and Midford sands.	14	.31	.34	2.44	.60
	Midford sands	55	.38	.36	.77	.48
		54	.38	.25	.45	.44
		45	.44	.38	.58	.41
		5	.33	.49	.31	.39
		92	.26	.60	.42	.29
	Junction Midford sands and marlstone.	6	.21	.31	1.34	.41
		43	.57	.32	1.39	.10
	Marlstone	7	.36	.49	.59	.38
		70	.30	.63	.65	.02
		75	.76	.33	.80	.43
		78	.58	.47	2.44	.61

Chemical composition of the soils of Great Britain and Ireland—Continued.

ENGLAND—Continued.

County.	Description and locality.	Original sample No.	Potash (K_2O.)	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
			Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Dorset	Junction marlstone and lower Lias.	24	0.27	0.29	0.72	0.38
		44	.69	.35	.95	.39
	Lower Lias	17	.32	.40	2.28	.16
		74	.65	.51	1.14	.84
		93	.51	.53	.96	.55
Essex [a]	Birch		.38	.10	.57	
	Bulvan		.32	.10	.83	
	Burnham		.17	.18	1.78	
	Hedingham		.53	.16	1.18	
	Gosfield		.14	{ .14 .24 }	.63	
	Orsett		.12	.08	.36	
	Ramsden		.15	.22	.92	
	Roxwell		.79	.20	5.96	
	Saffron Walden		.34	.11	3.85	
			.41	.10	5.80	
			.48	.09	7.75	
	Tendring		.20	.16	.29	
	Thaxted		.18	.13	.85	
	St. Osyth		.16	.09	1.63	
	Yeldham		.52	.15	1.64	
Cambridge [b]	Hatley plot	3	.85	.39	.88	
	Joint rotation	9	.64	.22	.90	
	Burgoyn's (Univ. farm):					
	Fields 11–13		.625	.083	2.20	
	Fields 14–15		.559	.139	2.15	
	Fields 16–17		.58	.22	.76	
	Fields 18–19		.575	.091	.90	
	Bowlder clay:					
	Above Gauit	14	.948	.14	3.95	.285
	Above Green sand	19	.785	.113	.78	.28
	Above Gault	20	.994	.107	1.22	.35
	Above Grey chalk	21	.963	.102	1.325	.60
	Gault soils	3	1.14	.14	3.87	.29
		7	1.143	.127	7.28	.15
		8	1.13	.097	4.74	.215
	Kimeridge clay soils	12	1.13	.147	.425	.134
		15	1.00	.098	.515	.18
		17	1.58	.093	2.425	.155
	Ampthill clay soils	6	.655	.096	.48	.145
	Oxford clay soils	10	1.06	.118	.323	.215
		11	1.11	.145	.322	.47
		22	1.09	.138	.308	.25
	Lower green sand soils	5	.236	.204	.065	.08
		23	.278	.259	.085	.125
		18	.47	.197	.34	.24
		9	.443	.169	.26	.17
		6	.47	.146	.15	.14
Lincolnshire [c]	Peaty matter from the fens.			.25	2.23	
	Fen soil	I	.42	.26	1.44	.28
		II	.43	.21	1.50	.34
		III	.28	.16	1.02	.42
	Marsh soil	I	.16	.16	2.16	.40
		II	.20	.21	2.12	.28
	Farm near Crowland	I	.08	.77	1.20	.30
		II	.07	1.02	1.00	.50
		III	.08	1.24	.87	.13
		IV	.11	1.20	1.24	.21
		V	.08	.68	1.09	.39
		VI	.09	1.23	2.00	.40

[a] Dymond, The Essex Field Experiments, 1896–1901, Part I. Compiled for the Essex Technical Instruction Committee.
Jour. Essex Tech. Laboratories, 3, 163 (1897).
Dymond and Bull, the Essex Field Experiments, 1896–1903, No. 2.
Guide to Experiments at Univ. Farm and other Centers in the Eastern Counties, Cambridge University, 1907.

[b] Guide to Experiments at University Farm and other Centers in the Eastern Counties, Cambridge University, 1907.
Foreman, Journal Agricultural Science, 2, 161 (1907).

[c] E. W. Bell, Chemical News, 68, 191 (1893), used HCl (S. G. 1.16).
R. H. Wilson, Chemical News, 70, 153 (1894).

Chemical composition of the soils of Great Britain and Ireland—Continued.

ENGLAND—Continued.

County.	Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesi (MgO).
			Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Northumberland [a]	Cockle Park (unmanured plot).	1	0.283	0.106	0.306	....
	Miniature Farms	9	.244	.087	.265	....
		1	.04	.12	....	....
		2	.04	.11	....	....
		3	.04	.13	....	....
		4	.05	.13	....	....
		5	.04	.13	....	....
		6	.05	.12	....	....
	Hanging Leaves	265	.49	.06	.43	....
	Castle Steads	267	.31	.07	.25	....
	Davy Houses	266	.20	.08	.27	....
	East Tower Hill	....	.06	.17	....	....
	Peepy	....	{ .144 .114 }	.034	.48	....
	Whitefield	....	.072	.115	.45	....
	Kimblesworth	355	.27	.07	.33	....
	Cockle Park:					
	Tower Hill	....	.44	.12	.79	....
	Back House	....	.263	.097	.286	....
	Tree Field	....	.50	.07	.69	....
	Pallace Leas Field plot	1	.36	.10	.44	....
		2	.40	.08	.44	....
		6	.33	.06	.39	....
		8	.28	.06	.37	....
		12	.39	.06	.55	....
		13	.30	.05	.42	....
Northampton [b]	Cransley plot	1	.54	.116	.60	....
		2	.57	.145	.67	....
		3	.59	.08	.53	....
		4	.66	.155	.62	....
		5	.50	.139	.45	....
		6	.54	.133	.58	....
		7	.49	.142	.79	....
		8	.50	.113	.45	....
		9	.65	.112	.84	....
		10	.65	.122	.76	....
Isle of Ely [c]	Black soils:					
	White Fen Benwick	....	.604	.306	2.95	....
	Littleport Fen	....	.559	.284	4.39	....
	Wryde	....	.458	.432	2.54	....
	Loam, Wisbech Fen	....	.602	.383	3.54	....
	Clays, Wryde	....	.532	.264	.764	....
			1.276	.374	1.48	....
	Silts, Wryde	....	.392	.224	3.19	....
	Silts, Needham	....	.281	.245	1.58	....
			.288	.192	1.57	....
Cheshire [d]	....	1	.30	.10	.54	....
		2	.41	.30	.60	....
Norfolk [e]	Saxlingham	5	.09	.082	.47	....
	Stanhoe	7	.112	.057	1.39	....
	Trowse plot	3	.13	.16	1.43	....
Suffolk [f]	Bramford	....	.19	.18	2.18	0.27
	Saxmundham	....	.71	.248	1.59	....
Durham [g]	Grange Hill plot	116	.07	.13	....	....
	Shield Ash plot	1	.35	.09	.54	....
		11	.47	.13	.81	....

[a] Somerville Agricultural Experiments, 5 years' work at the Northumberland County Demonstration Farm, 1902, pp. 62 and 167.
Gilchrist, Bulletin 4, Armstrong College, Newcastle upon Tyne.
Ninth Annual Report on Experiments, Counties of Cumberland, Durham, and Northumberland, 1900.
Gilchrist, Bulletin 8, County Agricultural Experiment Station, Newcastle upon Tyne.

[b] The Improvement of Poor Pastures, Report on an Experiment at Cransley, Northamptonshire, in seasons 1901, 1902, and 1903, Cambridge University.

[c] First Annual Report of Experiments, 1897, Cambridge, and Counties Agricultural Education Scheme.
Guide to Experiments at University Farm and other Centers in the Eastern Counties, Cambridge, 1907.

[d] Yearbook College of Agriculture and Horticulture, Holmes Chapel, Cheshire, 1904.

[e] Guide to Experiments at University Farm and other centers in the Eastern Counties, Cambridge University, 1907.

[f] Report on Experiments at Bramford and Saxmundham.

[g] Sixth Annual Report on Experiments in Counties of Cumberland, Durham, and Northumberland, 1897.
Tenth Annual Report on Experiments in Counties of Cumberland, Durham, and Northumberland, 1901.

Chemical composition of the soils of Great Britain and Ireland—Continued.

ENGLAND—Continued.

County.	Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid. (P_2O_5).	Lime (CaO).	Magnesia (MgO).
			Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Cumberland[a]	Rose Bank plot	497	0.37	0.05	0.27	...
		499	.33	.05	.28	...
		501	.30	.05	.25	...
Hampshire[b]	Newlands Manor, Lymington.	4	.26	.17	.70	0.46
	West Mark, near Petersfield.	5	.16	.145	.84	.29
Oxford[c]	Wick. Farm:					
	Headington, I	2	.03	.049	.45	Trace.
	Headington, II	3	.19	.12	5.49	Trace.
Berkshire[d]	Sutton's seed trial grounds, Reading.	1	.17	.37	.80	.10
					$CaCO_3$	
Wiltshire[e]	Christchurch Allotment Station, Warminster.	...	.38	.34	4.17	.27
	Boreham road, Warminster.	...	.369	.258	.195	.21
			.31	.30	.165	.29
	Horningsham	...	.366	.254	.125	.18
	Heytesbury	...	.42	.45	55.36	.13
	Codford allotment soil	...	.179	.466	12.21	...
	Chitterne allotment soils	...	.246	.908	47.50	...
	Imber allotment	1	.154	.370	42.35	...
		2	.259	.402	49.97	...
	Corsley plot	...	.459	.134	.60	...
	Clay soil, Warminster	...	.184	.255	25.55	...
	York warp soil	...	.308	.223	4.17	...
Kent[f]	London clay:					
	Whitstable	...	1.13	.119	.35	2.02
	Sheppey	...	1.44	.111	.224	1.24
	Chalk soils:					
	Wye	...	.345	.143	7.91	.193
	Minster, Thanet	...	.478	.101	1.96	.58
			.459	.094	3.70	.64
	Sutton-by-Dover	...	.432	.192	18.1	.69
	Meopham	...	.59	.126	12.2	.62
	Wye Court	...	...	.244	31.4	...
			...	.151	14.84	...
	Wye S. E. A. C	...	...	.194	33.4	...
	Olantigh	...	...	.180	47.7	...
	Wye	...	...	.177	28.6	...
	Charing	...	.623	.217	30.9	...
	East Lenham	...	.64	.109	14.2	...
	Charing	...	.479	.132	.44	...
			1.07	.136	.99	...
	Gault soils:					
	Brook	...	.899	.133	2.52	.040
			.901	.253	.019	.072
	Westwell	...	.739	.084	.061	...
			...	.048	2.42	...
	Charing	...	...	.038	.20	...
	East Lenham	...	.837	.12	13.2	...
	Brook	...	.915	.16	.022	...
			1.01	.131	1.76	...
	East Lenham	...	.64	.199	10.6	...
	Hothfield	...	.515	.132	.85	...
Surrey[f]	London clay:					
	Wanborough Station	...	.329	.065	.065	.35
	Ashtead Common	...	.76	.093	.002	1.12
	Wyke	...	.36	.061	.24	...
	Flexford	...	.478	.066	2.4	...
	Stoughton	...	...	.053	.057	...
	Wanborough	...	.493	.078	.03	...
	Raynes Park	...	.67	.097	.073	...
	Horsley	...	.45	.116	.19	...
	Chalk soils:					
	Seale	...	.236	.18	56.9	.40
	Fetcham	...	.298	.193	39.0	2.81
	Puttenham	...	...	.166	53.6	...
	Wanborough	...	...	.163	61.4	...
	Sutton	...	.265	.138	6.98	...

[a] Tenth Annual Report on Experiments in Cumberland, Durham, and Northumberland.
[b] Gilchrist and Foulkes, Suppl. I, Jour. Extension College, Reading, 1896.
[c] Gilchrist and Foulkes, Suppl. I, Jour. Extension College, Reading, 1896.
[d] Gilchrist and Foulkes, Suppl. I, Jour. Extension College, Reading, 1896.
[e] Report on Experiments, Wilts County Council Technical Education Committee, 1892, 1893, 1895.
[f] Hall and Plymen. South-Eastern Agricultural College, Wye, First Report on Chemical and Physical Study of the Soils of Kent and Surrey, 1902.

Chemical composition of the soils of Great Britain and Ireland—Continued.

ENGLAND—Continued.

County.	Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
			Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Surrey	Gault soils, Alder Holt	....	0.968	0.092	0.040	0.009
			....	.151	.025	....
			....	.074	.039	....
			.394	.0895	.024	....

WALES.[a]

County.	Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
	Garden soil	....	0.142	0.306	CaO. 1.40	0.671

SCOTLAND.[b]

County.	Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
	Cleghorn, near Lanark:				$CaCO_3$.	
	Plot 1	....	0.187	0.104	0.44	....
	Plot 2	....	.116	.126	.32	....
					CaO.	
	Drumfork, Helensburgh	....	.237	.45	0.168	....
	Easterboard, Croy	....	.213	.128	.403	....
	Birgidale Knock, Rothesay	....	.928	.244	.638	....
	Tarves	....	.539	.481	.594	....
	Wester Fintray, Kintore	....	.244	.283	.593	....
	Fedderate, Maud	....	.247	.367	.568	....
	Tulloch, Lumphanan	....	.279	.113	.826	....
	Fasque, Fettercairn	....	.463	.214	.759	....

IRELAND.[c]

County.	Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Cork	Limestone soils, Shanagany	....	0.464	0.148	3.938	....
	Old red sandstone, Killeagh	....	.547	.156	.201	....
Wexford	Silurian clay slate soils:					
	Bally-Carney	....	.384	.156	.268	....
	Clonroche	....	.720	.167	.301	....
Tipperary	Limestone soils:					
	Rockford	....	.846	.16	1.568	....
	St. Kieran's	....	.943	.13	1.266	....

[a] Annual Report Field Experiments, University College of Wales, Aberystwyth, 1899.
[b] Reports on Experiments, 1893, Glasgow and West of Scotland Technical College.
Reports on Experiments, 1895, Glasgow and West of Scotland Technical College.
Reports on Experiments, 1903 and 1904, Aberdeen and North of Scotland College of Agriculture.
[c] H. C. Sheringham. Irish Agricultural Organisation Society. 1st Annual Report of Field Experiments in Counties of Wexford, Cork, Tipperary, Mayo, Meath, King's County and Queen's County, 1899.

England.—Two hundred and sixty-nine samples were reported upon from England, the range in composition being for potash 0.03 to 1.58 per cent, phosphoric acid 0.034 to 1.24 per cent, lime 0.002 to 61.4 per cent, and magnesia 0.009 to 2.81 per cent.

Wales.—Only one sample has been reported upon from Wales having 0.142 per cent potash, 0.306 per cent phosphoric acid, 1.4 per cent lime, and 0.671 per cent magnesia.

Scotland.—Ten samples were reported upon from Scotland the range in composition being for potash 0.116 to 0.928 per cent, phosphoric acid 0.104 to 0.481 per cent, and lime 0.168 to 0.826 per cent.

Ireland.—Six samples were reported upon from Ireland, the range in composition being for potash 0.384 to 0.943 per cent, phosphoric acid 0.13 to 0.167 per cent, and lime 0.201 to 3.938 per cent.

Chemical composition of the soils of France.

AISNE.[a]

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LAON.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Semilly	1	0.36	0.09	11.22	0.007
	4	.60	.11	5.07	.003
	6	.22	.07	.52	.004
Chambry	1	.29	.18	5.44	.004
	3	.21	.09	7.45	.01
	5	.27	.13	34.12	.01
	7	.28	.14	15.55	.004
	8	.08	.03	.92	.005
	10	.28	.06	.86	.005
Bucy-les-Cerny	1	.44	.16	1.76	.01
	3	.41	.07	3.36	.005
	5	.44	.09	6.32	.01
Crépy-en-Laonnois	1	.28	.06	.96	.05
	3	.29	.08	2.83	.02
	7	.22	.07	34.53	.01
	9	.16	.06	.60	.01
	11	.24	.08	.32	.005
	14	.25	.10	2.40	.01
	16	.19	.12	7.64	.01
	17	.27	.10	58.00	.01
Vorges	1	.20	.24	5.56	.01
	3	.20	.08	1.04	.005
	5	.22	.08	.60	.01
	7	.33	.10	1.98	.004
	8	.06	.06	59.50	.01
	9	.48	.08	9.36	.01
Presles	1	.38	.06	3.71	.03
	3	.12	.04	3.52	.005
	5	.30	.05	.15	.005
Montbérault	1	.37	.08	64.75	.02
	3	.20	.06	2.43	.01
	5	.47	.10	1.10	.06
	8	.07	.04	.18	.005
	11	.42	.11	10.40	.16
	13	.32	.05	4.69	.005
	15	.29	.08	.71	.04
Chevregny	1	.16	.02	.64	.02
	3	.47	.07	2.24	.02
	5	.16	.08	.64	.01
	7	.28	.07	.96	.01
	8	.26	.03	29.20	.01
	9	.21	.07	7.80	.004
	11	.52	.03	.76	.01
	13	.70	.26	7.08	.02
	15	.71	.10	37.00	.005
Urcel	1	.10	.03	.09	.01
	3	.22	.09	4.64	.18
	6	.25	.05	.17	.003
	7	.30	.09	1.12	.015
	9	.12	.04	31.31	.005
Quincy-Basse	1	.10	.08	1.08	.005
	3	.26	.07	2.68	.05
	5	.16	.08	.88	.02
Landricourt	1	.12	.06	.08	.01
	3	.19	.06	.60	.005
	6	.30	.08	.48	.02
	8	.30	.08	.92	.01
	10	.39	.10	1.72	.02
Jumencourt	1	.18	.08	9.20	.006
	2	.57	.08	.76	.27
	4	.18	.08	39.70	.01
Folembray	1	.25	.03	1.60	.01
	3	.12	.04	.08	.02
	5	.22	.03	2.93	.08
	7	.15	.03	.32	.003
	8	.11	.04	1.70	.02
	10	.15	.05	.50	.01
Leuilly-sous. Coucy	1	.22	.09	1.76	.006
	3	.24	.10	2.00	.003
	4	.26	.06	.52	.005
	7	.23	.05	.37	.003
Crécy-au-Mont	1	.23	.12	4.94	.01
	3	.27	.07	.28	.01
	5	.29	.11	.68	.02
	7	.25	.08	.64	.39
	9	.19	.06	51.20	.01
	11	.47	.09	7.98	.01

[a] Bul. Sta. Agron. Dép. de l'Aisne, 1892, 1893, 1894.

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LAON—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Crécy-au-Mout	13	0.50	0.07	0.72	0.02
	15	.15	.04	2.39	.01
Pont-Saint-Mard	1	.18	.06	.24	.006
	3	.25	.08	.52	.006
	5	.26	.08	32.30	.03
	7	.30	.03	.17	.006
	9	.26	.06	.84	.005
Vaudesson	3	.17	.06	.72	.02
	5	.21	.08	17.08	.01
	6	.38	.10	.18	.02
	8	.19	.06	.41	.01
	10	.33	.08	.18	.004
	12	.25	.05	1.00	.47
Couvrelles	1	.55	.13	2.12	.006
	5	.40	.06	.15	.006
	7	.27	.06	.40	.006
	9	.39	.03	3.23	.005
	11	.26	.04	.15	.02
	13	.38	.09	.79	.07
	15	.31	.09	.86	.06
Mercin	1	.20	.09	.72	.01
	3	.22	.11	.73	.01
	7	.28	.06	1.00	.01
	9	.23	.04	.36	.004
	11	.22	.04	3.14	.04
	13	.08	.13	.55	.01
Amifontaine	1	.24	.24	7.08	.004
	3	.23	.10	13.21	.005
	4	.13	.09	10.60	.007
	5	.39	.19	33.92	.006
	6	.15	.19	10.48	.005
	7	.45	.13	33.70	.006
	8	.18	.06	9.34	.01
	10	.29	.16	63.80	.007
	11	.26	.09	14.40	.007
Juvincourt	1	.23	.09	13.12	.005
	2	.14	.07	1.34	.01
	4	.28	.11	35.50	.12
Berry-au-Bac	1	.37	.16	49.20	.03
	2	.32	.21	25.00	.03
	4	.30	.12	23.60	.04
Gernicourt	1	.29	.10	4.82	.01
	2	.09	.02	.68	.005
	4	.32	.16	9.90	.006
	6	.27	.27	30.70	.06
	7	.17	.07	75.90	.01
Clermont-les-Fermes	1	.25	.10	.57	.02
	3	.37	.17	6.00	.01
	5	.20	.11	1.28	.003
	7	.30	.12	2.19	.003
	9	.31	.08	.98	.002
	11	.35	.10	.45	.003
	13	.25	.08	.36	.04
	15	.21	.08	.16	.005
	17	.43	.10	3.80	.004
Missy-les-Pierrepont	1	.19	.06	.29	.006
	3	.27	.15	2.24	.008
	4	.40	.07	2.66	.07
	6	.29	.06	.38	.03
	8	.28	.09	.70	.02
Grandlup	1	.35	.13	30.94	.01
	2	.21	.08	22.20	.01
	3	.24	.06	.28	.01
	5	.40	.14	1.63	.01
	7	.38	.14	3.08	.01
	8	.15	.09	1.63	.01
Frières-Faillouel	1	.19	.08	1.70	.006
	3	.29	.09	5.16	.01
	5	.30	.07	.38	.10
	9	.35	.09	5.46	.005
	10	.33	.07	2.32	.01
Liez	1	.25	.11	3.06	.005
	4	.32	.07	5.24	.01
	6	.22	.08	3.18	.004
	8	.27	.12	39.50	.01
	10	.20	.11	1.05	.005
	12	.18	.20	.36	.01
	14	.24	.08	1.33	.01

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LAON—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Charmes	1	0.47	0.11	0.58	0.003
	3	.25	.07	2.62	.02
	5	.58	.13	5.28	.004
	7	.15	.09	1.56	.004
	9	.27	.09	1.60	.01
	12	.85	.12	7.04	.01
Rogécourt	1	.28	.10	3.08	.05
	3	.13	.08	2.03	.07
	5	.24	.08	3.14	.01
	8	.28	.09	1.13	.006
	9	.23	.04	3.68	.02
Fressancourt	1	.28	.08	.52	.02
	3	.29	.08	1.96	.05
	5	.26	.10	2.32	.008
	7	.28	.10	5.84	.005
Faucouzy	1	.31	.10	4.50	.04
	4	.37	.15	3.40	.05
	5	.32	.20	65.50	.003
	6	.34	.09	.72	.04
	8	.60	.18	28.80	.004
	10	.22	.11	2.40	.08
	12	.61	7.14	19.70	.02
	14	.35	6.87	62.00	.01
Chevresis-Monceau	1	.28	.10	5.10	.01
	3	.22	.10	33.88	.005
	5	.08	.05	35.08	.01
	7	.25	.10	15.65	.004
	9	.05	.10	48.30	.004
Grugies	1	.34	.08	.25	.01
	4	.35	.14	4.76	.01
	6	.45	.06	8.22	.005
	8	.27	.04	41.44	.005
	9	.24	.08	.46	.005
Crézancy	1	.20	.06	34.20	.02
	5	.29	.03	.54	.01
	7	.47	.10	8.26	.02
	11	.33	.09	10.20	.01
Épieds	1	.21	.07	1.15	.006
	3	.26	.06	.28	.01
	6	.27	.06	.78	.02
	9	.48	.07	16.98	.01
	11	.21	.06	.68	.02
	13	.19	.05	1.50	.02
Torcy	1	.19	.05	.68	.006
	3	.09	.04	1.28	.006
	5	.18	.06	8.91	.04
	7	.26	.08	3.30	.03
	9	.20	.05	.61	.01
	11	.35	.05	.98	.02
Pouilly-sur-Serre	1	.23	.15	2.19	.004
	3	.35	.04	.45	.003
	5	.25	.04	5.24	.005
	7	.32	.04	.34	.005
	9	.30	.23	8.00	.004
	10	.30	.06	33.93	.005
	13	.65	.05	3.25	.003
Nouvion-et-Catillon	1	.33	.03	.80	.005
	3	.39	.10	.50	.003
	5	.43	.05	1.70	.01
	6	.42	.11	1.42	.005
	8	.30	.08	.48	.006
	10	.30	.09	.70	.005
	12	.37	.07	1.28	.01
	13	.35	.07	.48	.01
	15	.24	.12	53.20	.005
Mesbrecourt-Richecourt	1	.35	.11	4.20	.006
	3	.37	.14	.38	.003
	5	.58	.08	.39	.01
	7	.32	.13	1.18	.01
	9	.26	.11	49.00	.01
	10	.46	.05	1.30	.006
	12	.44	.11	1.24	.01
	14	.51	.10	.39	.01
	16	.27	.12	1.16	.006
La Ferté-Chevresis	1	.34	.08	2.58	.01
	3	.46	.11	1.16	.01
	5	.38	.13	.74	.01

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LAON—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
La Ferté-Chevresis	7	0.30	0.11	28.44	0.004
	8	.37	.19	45.16	.01
	9	.31	.12	1.95	.005
	11	.69	.16	.67	.006
	13	.32	.11	9.98	.01
Valécourt	1	.33	.20	56.45	.005
	2	.57	.06	2.60	.006
	5	.39	.07	3.94	.01
	7	.37	.10	.66	.01
	10	.32	.08	36.80	.01
	11	.37	.09	1.24	.01
Pargny-les-Bois	1	.32	.04	.30	.01
	3	.13	.13	62.00	.01
	6	.42	.10	1.06	.01
Bois-les-Pargny	1	.33	.05	.28	.05
	3	.48	.08	.84	.004
	5	.21	.09	.38	.01
	7	.34	.07	.64	.01
Erlon	1	.14	.08	1.36	.01
	3	.29	.08	.52	.01
	5	.28	.09	.46	.002
	7	.30	.07	.37	.01
	9	.24	.05	.70	.02
	11	.15	.14	62.45	.04
Marcy	1	.20	.04	.32	.003
	3	.30	.15	37.00	.003
	5	.36	.12	.60	.10
	7	.27	.08	.41	.006
Voyenne	1	.23	.08	.68	.01
	3	.37	.13	.18	.01
	5	.31	.12	7.88	.01
	7	.27	.14	15.53	.01
	9	.28	.18	7.96	.01
Marle	1	.42	.16	.85	.006
	3	.31	.07	1.00	.01
	5	.41	.09	.70	.02
	7	.23	.07	.80	.02
	9	.47	.14	.80	.01
Houry	1	.42	.09	1.18	.01
	3	.50	.18	1.44	.01
	6	.27	.10	1.65	.02
	8	.48	.13	2.96	.01
	10	.35	.09	4.78	.01
Prisces	1	.61	.15	.76	.006
	3	.30	.16	1.47	.005
	5	.53	.23	.64	.007
	7	.34	.13	1.30	.006
	9	1.30	.80	.70	.006
Gronard	1	.33	.08	1.04	.03
	4	.26	.07	.56	.003
	6	.28	.03	1.84	.005
Agnicourt-et-Séchelles	1	.28	.11	3.00	.02
	3	.28	.26	8.08	.01
	5	.30	.10	1.18	.01
	7	.26	.18	2.55	.01
	9	.25	.25	53.50	.02
	10	.51	.15	.68	.01
	12	.30	.10	.32	.01
	14	.21	.17	87.00	.01
Montloué	1	.23	.07	.32	.01
	3	.28	.09	.68	.01
	5	.45	.08	.78	.01
	7	.21	.15	56.00	.02
	9	.35	.17	1.68	.04
Noircourt	1	.43	.06	5.88	.01
	3	.50	.08	.36	.006
	5	.29	.06	3.55	.02
	7	.41	.11	13.50	.003
	11	.15	.16	38.00	.006
	12	.40	.08	.98	.01
	14	.14	.10	1.97	.02
	16	.43	.06	1.36	.03
	18	.35	.05	.48	.01
Goudelancourt	1	.39	.18	26.50	.004
	3	.23	.07	.50	.005
	5	.41	.10	.72	.01

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LOAN—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Ebouleau	1	0.52	0.08	0.25	0.004
	3	.39	.07	.40	.004
	5	.25	.09	.42	.007
	7	.28	.05	42.00	.007
Bucy-les-Pierrepont	1	.16	.06	.42	.003
	3	.24	.08	29.50	.004
	5	.20	.07	.52	.02
	7	.44	.08	.42	.01
	9	.39	.07	.34	.003
	11	.40	.06	.44	.01
	13	.27	.02	.12	.004
	15	.37	.08	.72	.01
Boncourt	1	.25	.09	.28	.12
	3	.29	.07	.26	.03
	5	.28	.10	.48	.01
	7	.28	.08	.80	.11
Lappion	1	.30	.11	47.00	.02
	3	.14	.04	.22	.01
	5	.23	.04	.12	.02
	6	.26	.05	.28	.02
	8	.29	.07	.24	.02
	10	.28	.15	94.70	.19
	13	.37	.04	.64	.03
La Selve	1	.32	.04	1.84	.02
	2	.14	.08	48.00	.007
	3	.26	.07	.78	.02
Sissonne	1	.24	.21	43.00	.005
	3	.33	.07	9.20	.004
	4	.24	.09	.80	.004
	5	.24	.13	23.22	.003
	6	.28	.15	15.64	.007
	7	.30	.50	16.19	.003
	8	.49	.32	10.71	.005
	9	.14	.06	.52	.004
	10	.12	.04	.24	.004
Machecourt	1	.29	.12	49.00	.009
	3	.35	.03	.80	.006
	5	.39	.11	1.40	.002
	7	.44	.06	1.96	.01
Chivres	1	.47	.17	20.00	.004
	3	.24	.14	46.60	.003
	4	.23	.05	.24	.01
	6	.41	.19	5.64	.23
Liesse	1	.27	.04	1.63	.004
Gizy	1	.20	.03	.52	.009
	3	.47	.04	.38	.007
	5	.30	.05	.20	.01
	7	.27	.09	.68	.02
Samoussy	1	.37	.06	.24	.008
	4	.27	.14	39.75	.01
	6	.24	.10	2.60	.01
	8	.23	.17	26.00	.02
Monceau-le-Waast	1	.25	.08	2.97	.01
	3	.19	.14	3.25	.03
Athies	1	.38	.12	.52	.01
	2	.40	.06	.28	.01
	4	.23	.09	1.00	.004
	6	.22	.07	.80	.007
	8	.29	.06	14.00	.006
	9	.27	.03	.64	.004
Eppes	1	.31	.09	86.00	.006
	2	.30	.06	8.00	.006
Coucy-les-Eppes	1	.16	.04	.30	.005
	3	.45	.08	.42	.004
	5	.19	.07	.36	.01
	6	.21	.03	.30	.001
	8	.47	.17	7.30	.01
	9	.29	.09	35.50	.003
	10	.25	.09	2.10	.003
Festieux	1	.16	.03	.16	.004
	3	.25	.07	10.50	.005
	4	.29	.13	25.44	.006
	5	.50	.08	1.50	.007
Veslud	1	.19	.04	.24	.003
	3	.18	.03	.04	.03
	4	.33	.05	.88	.004
	6	.35	.13	20.00	.01

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LOAN—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Parfondru	1	0.32	0.10	0.16	0.007
	2	.52	.15	2.88	.01
	5	.26	.05	5.40	.02
Bruyères	1	.14	.05	.24	.02
Arrancy	1	.32	.07	1.00	.008
	3	.27	.03	.84	.007
	5	.21	.05	10.88	.006
Ployart	1	.24	.11	.63	.007
	3	.44	.06	3.37	.03
	5	.18	.10	2.40	.01
Vaureseine	1	.37	.09	20.00	.007
	3	.33	.06	10.00	.02
	5	.24	.12	.40	.006
Montchalons	1	.40	.16	.60	.008
	3	.32	.10	3.40	.005
	5	.32	.04	.20	.005
Chérêt	1	.36	.07	47.00	.02
	2	.36	.07	19.00	.02
Orgeval	1	.25	.06	1.40	.007
	4	.27	.14	.84	.004
Bièvres	1	.26	.10	.44	.03
	3	.36	.17	20.00	.01
	4	.28	.10	11.00	.006
Martigny	1	.36	.07	1.10	.007
	3	.33	.07	13.06	.05
	4	.39	.12	13.18	.31
	5	.40	.07	.46	.08
Monampteuil	1	.20	.07	.99	.002
	3	.27	.05	.19	.005
	5	.20	.07	.23	.004
	7	.19	.07	.24	.005
	9	.34	.07	.45	.005
Braisne	1	.23	.67	.50	.03
	3	.28	.06	.48	.02
	5	.20	.05	.84	.02
	7	.17	.12	7.00	.01
Brenelle	1	.35	.04	.48	.01
Courcelles	1	.34	.05	.78	.01
	3	.47	.08	1.66	.03
	5	.24	.08	1.26	.03
	7	.28	.05	65.00	.01
	8	.16	.04	27.00	.01
	10	.20	.07	.44	.01
Limé	1	.32	.05	.74	.02
	3	.23	.05	.26	.01
	5	.31	.07	.42	.01
	7	.64	.07	.70	.01
	9	.32	.91	29.00	.01
Quincy-sous-Le-Mont et Bruyères	2	.26	.05	.30	.02
	4	.27	.06	.41	.005
	6	.24	.09	.56	.01
	8	.22	.05	.58	.01
Laffaux	1	.24	.05	1.09	.008
	3	.37	.07	1.90	.008
	5	.22	.06	.52	.007
Neuville-sur-Margival	1	.42	.07	.48	.01
	3	.29	.06	.30	.005
Terny-Sorny	1	.36	.06	1.42	.006
	3	.39	.12	21.20	.006
	5	.38	.06	1.22	.003
	7	.26	.06	.42	.004
	9	.30	.07	.72	.02
Margival	1	.28	.06	3.68	.01
	3	.48	.08	2.02	.01
	5	.28	.08	.82	.005
	7	.28	.05	81.00	.005
	9	.26	.06	3.68	.008
Vuillery et Braye-sous-Clamecy	1	.28	.07	.34	.003
Villemontoire	1	.24	.13	5.10	.02
	3	.29	.09	.72	.01
	5	.16	.07	18.20	.03
	7	.20	.09	.82	.03
	9	.16	.08	.60	.007
Buzancy	1	.27	.04	.98	.01
	3	.33	.06	1.70	.01
	5	.31	.06	.40	.006
	8	.31	.07	3.41	.03

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime $CaCO_3$).	Magnesium (MgO).
LAON—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Aconin	1	0.33	0.08	9.70	0.01
	3	.30	.09	1.10	.01
	4	.32	.06	.86	.02
	6	.37	.16	.40	.006
Cutry	1	.3	.05	.10	.005
	3	.38	.07	.24	.01
	5	.66	.07	1.88	.01
	7	.38	.06	.48	.004
Cœuvres-et-Valsery	1	.38	.08	.20	.01
	3	.24	.06	.24	.006
	5	.26	.07	54.00	.01
	6	.34	.12	2.24	.008
	7	.37	.08	.36	.01
Saint-Pierre-Aigle	1	.29	.03	.48	.007
	3	.25	.07	.24	.01
Laversine	1	.33	.02	.28	.005
	3	.31	.08	.28	.01
Dommiers	1	.31	.06	.20	.01
	3	.37	.10	.36	.05
Berny-Rivière	1	.8	.12	41.90	.003
	2	.80	.14	17.00	.003
Nouvron	1	.57	.08	.73	.01
	3	.64	.09	.65	.01
	5	.32	.06	.45	.003
	7	.42	.06	5.09	.02
	8	.14	.01	86.70	.004
Morsain	1	.30	.05	2.16	.007
	2	.18	.07	.70	.005
	3	.22	.06	2.23	.005
	5	.20	.05	5.44	.01
Vézaponin	2	.30	.05	3.04	.01
	4	.50	.03	.50	.01
	6	.44	.05	.30	.01
Selens	1	.29	.28	1.48	.01
	4	.12	.06	44.00	.01
	5	.39	.06	3.00	.03
	8	.35	.08	.61	.01
	10	.26	.04	1.18	.03
Saint-Aubin	1	.26	.06	1.08	.05
	3	.15	.05	2.80	.06
Trosly-Loire	1	.24	.06	2.27	.04
	3	.16	.06	.68	.05
	4	.19	.08	1.52	.06
	5	.17	.07	.82	.06
	7	.22	.03	9.96	.06
	8	.17	.09	2.08	.05
	9	.22	.07	.78	.03
Villequier-Aumont	1	.32	.05	.68	.01
	4	.57	.22	.38	.004
	6	.26	.08	.38	.008
	8	.26	.05	.82	.01
	10	.28	.05	.38	.01
Landouzy-la-Cour	2	.27	.11	2.30	.01
	4	.32	.06	.64	.01
	6	.35	.10	.38	.01
	10	.23	.09	.60	.01
	12	.34	.08	.20	.007
	14	.39	.08	1.00	.006
Vervins	1	.27	.11	.32	.01
	3	.24	.10	.20	.007
	5	.36	.10	1.28	.01
Font 'ne-les-Vervins	1	.28	.11	.60	.008
	3	.39	.10	93.00	.007
	4	.33	.10	.68	.009
	6	.32	.07	2.20	.006
	8	.40	.10	1.84	.007
Laigny	1	.29	.04	.44	.001
	3	.30	.10	.80	.006
	6	.30	.11	9.44	.01
Haution	1	.31	.08	1.24	.006
	3	.26	.09	.32	.007
Voulpaix	1	.31	.09	.56	.003
	2	.66	.07	.36	.007
	3	.24	.08	1.24	.01
	5	.28	.09	.88	.008

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LAON—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Marfontaine	1	0.31	0.17	1.96	0.01
	2	.24	.06	.36	.01
	4	.28	.09	.52	.004
Rougeries	1	.33	.09	.92	.006
Presles	1	.25	.05	.35	.01
Nouvion	1	.47	.10	1.68	.006
	4	.30	.05	.15	.005
Laval	3	.27	.10	.56	.006
	6	.12	.06	.60	.02
Monthenault	1	.54	.07	.52	.005
	3	.46	.07	.16	.005
	5	.40	.04	.72	.004
	7	.40	.06	.06	.004
	8	.35	.04	1.64	.005
Chamouille	1	.32	.10	2.56	.05
	2	.38	.08	6.60	.006
Courtecon	1	.27	.06	.36	.006
	3	.26	.06	.70	.02
	5	.26	.06	.48	.003
	7	.37	.17	.96	.007
	10	.33	.08	11.30	.03
Pancy	1	.24	.02	.20	.007
	3	.52	.09	.52	.01
Colligis	1	.52	.07	.84	.01
	3	.58	.05	9.96	.007
Crandelain	1	.28	.05	.24	.007
	4	.29	.07	.22	.01
	6	.33	.05	.18	.005
Trucy	1	.36	.07	.28	.003
	3	.33	.03	.20	.004
Lierval	1	.32	.06	19.86	.22
	2	.56	.12	8.52	.01
Lesdins	1	.34	.14	.44	.01
	3	.30	.16	56.40	.004
	5	.39	.08	2.80	.02
	7	.38	.13	1.44	.01
Levergies	1	.27	.10	18.04	.02
	4	.27	.07	2.04	.02
	6	.36	.09	.92	.01
	8	.37	.10	.54	.01
Gouy	1	.39	.07	3.70	.01
	3	.59	.14	.76	.005
	5	.40	.12	.76	.01
	7	.17	.12	42.40	.01
	8	.51	.12	1.08	.006
	10	.50	.10	.60	.01
	12	.51	.09	1.76	.004
	14	.44	.09	11.92	.01
	16	.38	.10	.64	.01
Prouvais	1	.22	.08	.68	.007
	3	.29	.06	2.80	.02
	6	.40	.22	32.70	.01
	7	.21	.24	34.00	.01
	9	.46	.30	52.00	.02
	10	.22	.15	7.44	.01
Molinchart	1	.36	.09	3.40	.01
	3	.27	.04	.32	.005
Clacy	5	.38	.09	44.50	.01
Merlieux	1	.30	.11	6.40	.02
	2	.32	.23	2.06	.03
	3	.38	.06	.16	.003
	5	.32	.04	.16	.003
Montbavin et Montarsène	1	.37	.07	.62	.01
	3	.26	.05	.76	.01
	5	.19	.04	.40	.01
	7	.23	.04	.12	.01
	8	.28	.05	.22	.01
	9	.20	.08	27.00	.02
Barisis	1	.22	.06	.64	.007
	3	.38	.08	1.00	.004
	6	.23	.06	22.00	.005
	7	.29	.05	1.08	.003
Mont-Saint-Martin	1	.42	.09	6.70	.02
	3	.39	.10	1.04	.007
	5	.36	.09	15.60	.01
	8	.45	.06	.48	.01

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LAON—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Nesles	1	0.23	0.06	0.48	0.02
	3	.38	.06	.28	.004
	5	.29	.06	.20	.005
	7	.26	.05	.60	.003
	9	.28	.10	.80	.01
Nogentel	3	.24	.06	32.00	.02
	4	.40	.23	5.80	.01
Étampes	1	.72	.09	1.36	.04
	2	.24	.12	7.50	.005
Chierry	1	.29	.15	15.92	.03
	3	.40	.20	20.00	.01
Fossoy	1	.77	.08	17.46	.03
	3	1.17	.12	13.74	.006
	5	.33	.06	14.96	.02
Seraucourt-le-Grand	1	.28	.14	3.53	.02
	3	.29	.06	.10	.02
	5	.50	.09	1.08	.01
	7	.28	.21	3.24	.007
Happencourt	1	.44	.15	3.23	.008
	3	.42	.22	31.00	.02
	5	.38	.10	8.64	.01
Artemps	1	.47	.13	2.98	.01
	3	.30	.10	1.56	.01
Clastres	1	.32	.05	.60	.005
Guise	1	.29	.08	.20	.02
	4	.64	.11	2.64	.03
	6	.40	.09	.70	.007
	8	.39	.03	.24	.003
Lesquielles-Saint-Germain	1	.27	.56	45.00	.01
	2	.46	.07	.72	.01
	4	.36	.12	3.04	.01
	6	.31	.10	.60	.003
Couvron	1	.31	.16	4.06	.04
	3	.34	.12	5.88	.03
	4	.17	.18	58.00	.02
	5	.21	.07	.20	.04
Barenton-Cel	1	.51	.10	2.62	.01
	3	.35	.09	8.70	.02
	4	.39	.09	1.62	.007
	6	.14	.19	72.00	.006
	8	.51	.08	.60	.003
	10	.41	.07	14.00	.009
Chalandry	1	.49	.09	1.80	.004
	3	.32	.12	2.10	.01
Cessiéres	1	.28	.12	.56	.001
	3	.33	.06	.36	.002
	5	.45	.05	.52	.002
	7	.34	.07	.36	.002
Guivry	2	.27	.07	.40	.003
	4	.24	.08	.48	.004
	8	.33	.09	.72	.004
Berlancourt	1	.38	.08	1.20	.02
	3	.43	.09	2.20	.05
	5	.27	.09	5.50	.01
	7	.23	.11	16.00	.006
	8	.36	.09	2.68	.02
Neuville-Saint-Amand	1	.41	.08	.20	.005
	3	.49	.12	2.00	.009
	5	.43	.03	2.16	.005
	7	.45	.16	47.00	.007
	8	.33	.07	3.02	.006
	10	.35	.07	1.40	.006
	12	.40	.09	1.60	.006
	15	.53	.18	1.00	.005
Remaucourt	1	.38	.16	3.36	.01
	3	.47	.13	1.62	.01
	6	.37	.12	2.52	.01
	9	.34	.22	39.50	.01
Vauxresis	1	.34	.07	.64	.002
Cuisy-en-Almont	1	.41	.09	.24	.004
	3	.31	.07	1.08	.002
Vieil Arcy	1	.36	.07	1.40	.003
	3	.14	.07	.40	.002
	5	.25	.07	16.00	.002
	7	.14	.10	3.16	.003
	10	.47	.25	13.60	.002

Chemical composition of the soils of France—Continued.

AISNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
LAON—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Dhuizel	1	0.39	0.07	0.60	0.004
	3	.25	.07	.76	.003
Longpont	1	.65	.16	1.00	.002
	2	.30	.07	.92	.004
	4	.35	.11	1.10	.005
	6	.43	.06	1.00	.004
	9	.34	.09	16.80	.002

PAS-DE-CALAIS.[a]

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
Erquières	1	0.268	0.119	0.405	....
	2	.137	.092	2.411	....
	3	.267	.098	1.836	....
	4	.267	.103	3.875	....
	5	.298	.211	15.565	....
	6	.219	.172	57.344	....
Guigny	1	.32	.143	1.652	....
	2	.35	.086	1.932	....
	3	.30	.104	1.897	....
	4	.289	.159	8.112	....
	5	.317	.121	35.971	....
Berthonval	1	.26	.10	1.17	....
	2	.33	.14	1.51	....
	3	.30	.115	.20	....
	4	.29	.22	23.39	....
	5	.34	.094	.925	....
Louez	1	.316	.116	.70	....
	2	.293	.118	1.20	....
	3	.388	.158	4.215	....
	4	.333	.19	4.265	....
	5	.319	.26	23.00	....
	6	.328	.252	23.00	....
Valhuon	1	.376	.096	1.12	....
	2	.314	.094	.716	....
	3	.245	.092	1.36	....
	4	.219	.094	1.05	....
	5	.266	.084	1.19	....
Saint-Martin	1	.121	.108	.135	....
	2	.176	.156	1.085	....
	3	.154	.15	.625	....
	4	.176	.156	2.70	....
	5	.169	.146	.475	....
	6	.185	.156	1.35	....
Longunesse	1	.191	.159	.533	....
	2	.198	.133	4.906	....
	3	.249	.121	1.183	....
	4	.248	.145	2.786	....
	5	.289	.158	1.848	....
	6	.30	.086	.648	....
	7	.198	.142	1.041	....
	8	.174	.098	1.041	....
Marck	1	.33	.116	18.011	....
	2	.256	.063	14.016	....
	3	.347	.129	25.145	....
	4	.25	.092	22.086	....
	5	.043	.031	.101	....
	6	.25	.116	14.974	....
Offekerque	1	.384	.104	16.412	....
	2	.29	.101	14.101	....
	3	.22	.092	13.834	....
	4	.291	.105	15.806	....
Guines	1	.235	.153	.96	....
	2	.282	.167	7.699	....
	3	.248	.254	21.334	....
	4	.324	.224	13.014	....
Faubourg Ronville	1	.26	.704	38.75	....
	2	.223	.704	34.427	....
	3	.257	.554	19.739	....
	4	.295	.40	4.572	....
	5	.258	.194	1.625	....
	6	.266	.642	9.939	....
Souastre	1	.268	.092	1.84	....
	2	.241	.091	1.47	....
	3	.277	.11	.518	....

[a] Pagnoul. Terres Arables de Pas-de-Calais, 1894. Bul. Sta. Agron. Pas-de-Calais, 1887-1895.

Chemical composition of the soils of France—Continued.

PAS-DE-CALAIS—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Sôuastre	4	0.267	0.075	1.504	....
	5	.239	.09	2.053	....
	6	.29	.08	2.21	....
	7	.249	.092	2.596	....
Pas	1	.262	.08	1.02	....
	2	.208	.134	3.866	....
	3	.311	.081	3.112	....
	4	.345	.08	.97	....
	5	.245	1.28	.923	....
	6	.256	.056	.031	....
	7	.177	.25	62.448	....
	8	.199	.104	1.62	....
	9	.31	.10	2.72	....
Serres	1	.278	.123	.961	....
	2	.122	.143	.468	....
	3	.30	.118	4.17	....
	4	.255	.106	.75	....
	5	.315	.114	1.62	....
	6	.263	.107	2.02	....
	7	.268	.11	1.11	....
Fresnes-lez-Montauban	1	.277	.162	33.272	....
	2	.36	.11	1.972	....
	3	.257	.085	1.901	....
	4	.323	.11	1.633	....
	5	.292	.231	42.112	....
Adinfer	1	.367	.114	1.14	....
	2	.337	.10	.861	....
	3	.307	.094	.526	....
	4	.262	.093	.774	....
	5	.286	.103	2.462	....
	6	.30	.106	1.208	....
	7	.288	.084	.125	....
	8	.253	.071	.077	....
Hénin-sur-Cojeul	1	.289	.186	14.40	....
	2	.228	.115	2.53	....
	3	.262	.123	2.30	....
	4	.313	.096	1.15	....
	5	.268	.163	10.42	....
	6	.313	.094	.93	....
Achicourt	1	.277	.571	7.173	....
	2	.263	.292	7.698	....
	3	.278	.16	1.901	....
	4	.329	.149	1.288	....
	5	.295	.159	2.263	....
	6	.257	.57	35.968	....
	7	.278	.584	32.988	....
	8	.355	.14	2.68	....
	9	.317	.329	4.67	....
Croisilles	1	.334	.109	2.061	....
	2	.286	.108	.592	....
	3	.308	.114	.992	....
	4	.305	.103	1.511	....
	5	.265	.114	12.525	....
	6	.325	.125	1.003	....
	7	.26	.157	16.67	....
	8	.282	.093	.459	....
La Herlière	1	.275	.075	2.917	....
	2	.273	.066	3.00	....
	3	.276	.08	1.904	....
	4	.249	.099	4.857	....
	5	.276	.089	2.145	....
Moyenneville	1	.309	.102	.614	....
	2	.317	.091	.208	....
	3	.317	.107	.774	....
	4	.306	.099	.811	....
	5	.215	.103	.381	....
	6	.345	.133	.684	....
Ablainzevelle	1	.316	.102	.603	....
	2	.162	.114	.59	....
	3	.304	.092	.359	....
	4	.266	.072	.251	....
	5	.269	.071	1.53	....
	6	.292	.102	.429	....
	7	.224	.073	1.845	....
	8	.25	.071	.102	....
	9	.269	.085	2.652	....
	10	.255	.081	.28	....

Chemical composition of the soils of France—Continued.

PAS-DE-CALAIS—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime $CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Havrincourt	1	0.272	0.111	1.537	....
	2	.237	.097	.799	....
	3	.283	.137	3.646	....
	4	.319	.103	.605	....
	5	.237	.124	3.469	....
	6	.399	.128	1.652	....
	7	.275	.09	.62	....
	8	.337	.159	.87	....
	9	.35	.106	.848	....
	10	.341	.122	2.628	....
	11	.25	.103	1.578	....
	12	.206	.27	39.918	....
Hesdigneul	1	.248	.081	.573	....
	2	.276	.087	.57	....
	3	.257	.139	.877	....
	4	.337	.116	1.687	....
	5	.268	.067	.245	....
	6	.205	.074	1.171	....
	7	.264	.073	.051	....
	8	.266	.072	.243	....
	9	.182	.095	.255	....
	10	.322	.126	1.413	....
Metz-en-Couture	1	.272	.116	2.536	....
	2	.228	.111	.93	....
	3	.227	.133	1.734	....
	4	.239	.107	.568	....
	5	.323	.131	.753	....
	6	.233	.105	.711	....
	7	.289	.118	2.344	....
	8	.218	.15	.876	....
	9	.218	.098	1.996	....
	10	.243	.105	.537	....
	11	.22	.103	2.599	....
Fontaine-lez-Boulans	1	.308	.096	1.884	....
	2	.38	.314	11.117	....
	3	.365	.083	65.90	....
	4	.297	.073	3.899	....
	5	.503	.39	14.713	....
	6	.545	.422	30.198	....
Clairmarais	1	.253	.054	2.171	....
	2	.414	.088	.675	....
	3	.284	.07	1.514	....
	4	.26	.069	.902	....
	5	.36	.081	1.022	....
	6	.378	.26	33.837	....
	7	.31	.078	2.12	....
	8	.31	.142	16.783	....
	9	.53	.10	3.685	....
Wizernes	1	.249	.074	.253	....
	2	.379	.063	1.059	....
	3	.271	.06	1.33	....
Racquinghem	1	.385	.072	.00	....
	2	.31	.093	.671	....
	3	.28	.099	.774	....
	4	.266	.086	1.224	....
	5	.353	.114	1.237	....
	6	.282	.039	1.003	....
	7	.557	.045	.929	....
	8	.761	.038	.608	....
	9	.178	.00	.00	....
Houlle	1	.232	.085	2.204	....
	2	.245	.161	28.211	....
	3	.254	.147	29.757	....
	4	.161	.309	3.034	....
	5	.304	.105	5.803	....
Moulle	1	.217	.082	2.203	....
	2	.171	.088	1.463	....
	3	.279	.105	4.167	....
	4	.21	.111	2.648	....
	5	.178	.102	3.439	....
Zoteux	1	.201	.126	2.08	....
	2	.293	.117	.436	....
	3	.287	.223	6.007	....
	4	.395	.209	1.807	....
	5	.196	.104	.212	....
	6	.272	.193	4.813	....

Chemical composition of the soils of France—Continued.

PAS-DE-CALAIS—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Mentque-Nortbécourt	1	0.144	0.162	61.819	....
	2	.292	.141	12.013	....
	3	.196	.141	6.114	....
	4	.297	.159	7.612	....
	5	.197	.151	39.253	....
	6	.266	.133	11.502	....
Isques	1	.404	.176	7.955	....
	2	.314	.139	1.005	....
	3	.199	.073	2.163	....
	4	.236	.092	.174	....
	5	.234	.09	.242	....
	6	.466	.257	9.746	....
Hubersent	1	.358	.248	8.238	....
	2	.147	.136	32.749	....
	3	.202	.093	3.213	....
	4	.272	.079	.328	....
	5	.211	.084	2.803	....
	6	.20	.071	.092	....
Bailleul-lez-Pernes	1	.357	.066	23.371	....
	2	.243	.079	.796	....
	3	.301	.083	1.466	....
	4	.214	.065	1.247	....
	5	.287	.121	.873	....
	6	.30	.175	6.479	....
Auchy-lez-Hesdin	1	.195	.124	3.594	....
	2	.224	.091	.332	....
	3	.27	.119	.694	....
Rang-du-Fliers	1	.23	.057	18.422	....
	2	.135	.086	2.065	....
	3	.225	.277	17.465	....
	4	.219	.061	21.053	....
	5	.208	.051	17.912	....
	6	.143	.083	14.489	....
Labourse	1	.40	.219	25.177	....
	2	.325	.225	23.305	....
	3	.281	.131	23.511	....
	4	.234	.087	1.00	....
	5	.257	.102	1.678	....
	6	.306	.219	23.619	....
	7	.342	.208	19.108	....
Feuchy	1	.329	.183	6.948	....
	2	.254	.086	.78	....
	3	.316	.092	1.124	....
	4	.165	.103	.55	....
	5	.317	.285	27.373	....
	6	.403	.189	7.627	....
Coupelle-Vielle	1	.232	.10	4.968	....
Boiry-Notre-Dame	1	.306	.092	.715	....
	2	.275	.092	.756	....
	3	.292	.088	.745	....
	4	.268	.088	.817	....
	5	.242	.093	1.069	....
	6	.277	.081	1.377	....
	7	.185	.043	.258	....
	8	.276	.098	.50	....
	9	.281	.077	.76	....
	10	.30	.086	.753	....
	11	.321	.185	18.21	....
	12	.297	.073	.64	....
	13	.28	.082	.372	....
	14	.251	.078	.616	....
Givenchy-en-Gohelle	1	.315	.136	1.224	....
	2	.366	.132	1.283	....
	3	.386	.155	3.864	....
	4	.282	.127	.88	....
	5	.367	.124	5.42	....
	6	.436	.178	5.891	....
Pénin	1	.306	.119	.769	....
	2	.261	.149	9.243	....
	3	.333	.149	3.681	....
	4	.203	.202	63.776	....
	5	.267	.139	1.119	....
	6	.331	.14	2.472	....
Baralle	1	.245	.093	2.246	....
	2	.224	.102	1.763	....
	3	.262	.272	14.719	....
	4	.289	.133	.741	....
	5	.269	.249	9.838	....
	6	.331	.164	3.219	....

Chemical composition of the soils of France—Continued.

PAS-DE-CALAIS—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Rebergues	1	0.35	0.206	14.421	....
	2	.647	.126	1.495	....
	3	.27	.222	47.525	....
	4	.32	.373	11.439	....
	5	.384	.164	81.513	....
	6	.189	.312	17.655	....
Agny	1	.39	.682	19.799	....
	2	.251	.163	2.265	....
	3	.236	.135	2.095	....
	4	.38	.192	4.135	....
	5	.298	.246	5.20	....
	6	.30	.258	11.348	....
Auchy-lez-Hesdin	1	.221	.202	1.268	....
	2	.176	.239	47.327	....
	3	.208	.21	7.066	....
	4	.239	.125	4.61	....
Herbelles	1	.244	.097	.708	....
	2	.27	.114	.273	....
	3	.238	.093	.765	....
	4	.241	.201	43.37	....
	5	.206	.095	.586	....
	6	.336	.155	7.123	....
Beussent	1	.411	.187	16.211	....
	2	.241	.134	51.008	....
	3	.293	.084	2.564	....
	4	.369	.135	3.493	....
	5	.273	.096	.716	....
	6	.224	.116	5.975	....
Divion	1	.224	.084	.978	....
	2	.237	.124	3.626	....
	3	.167	.046	.434	....
	4	.257	.116	4.754	....
	5	.19	.096	.869	....
	6	.239	.176	2.583	....
Aix-en-Issart	1	.328	.091	.331	....
	2	.323	.142	.888	....
	3	.292	.116	.316	....
	4	.152	.307	36.02	....
	5	.259	.09	1.004	....
	6	.247	.167	6.025	....
Hermies	1	.40	.269	6.881	....
	2	.341	.167	6.882	....
	3	.327	.159	2.329	....
	4	.27	.17	4.729	....
	5	.289	.124	.561	....
	6	.269	.138	1.413	....
Chérisy	1	.202	.121	1.026	....
	2	.228	.34	23.132	....
	3	.336	.133	.924	....
	4	.322	.20	.975	....
	5	.259	.174	3.929	....
	6	.173	.162	.839	....
Guarbecque	1	.296	.10	1.245	....
	2	.337	.097	1.114	....
	3	.294	.13	2.24	....
	4	.302	.128	1.312	....
	5	.219	.065	.788	....
	6	.308	.106	2.146	....
Izel-les-Hameau	1	.202	.107	.646	....
	2	.219	.225	38.899	....
	3	.279	.121	1.975	....
	4	.26	.087	.618	....
	5	.209	.091	.808	....
	6	.303	.12	2.784	....
	7	.277	.111	1.671	....
Camiers	1	.125	.179	48.777	....
	2	.119	.07	2 05	....
	3	.329	.379	9.588	....
	4	.213	.089	1.746	....
	5	.181	.163	41.025	....
	6	.235	.144	68 206	....
	7	.156	.119	6 145	....
	8	.207	.089	.277	....
Le Transloy	1	.242	.081	.914	....
	2	.279	.122	.52	....
	3	.217	.093	.426	....

PAS-DE-CALAIS—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Le Transloy	4	0.219	0.118	0.537	
	5	.254	.132	1.247	
	6	.296	.121	.769	
Blendecques	1	.26	.075	.877	
	3	.186	.08	.175	
	5	.133	.089	.289	
	7	.205	.101	2.063	
	9	.22	.203	11.44	
	11	.192	.167	13.74	
Fleurbaix	1	.321	.09	.997	
	2	.34	.083	.94	
	3	.372	.113	.739	
	4	.358	.105	2.086	
Bernieulles	1	.277	.083	.322	
	2	.275	.079	5.241	
	3	.239	.091	.854	
	4	.221	.081	2.599	
	5	.214	.089	1.053	
	6	.339	.077	4.612	
Duisans	1	.235	.111	1.348	
	2	.361	.198	2.94	
	3	.298	.089	.834	
	4	.326	.12	.528	
	5	.281	.158	1.989	
	6	.209	.221	48.356	
	7	.292	.126	5.413	
Bucquoy (Essart)	1	.233	.08	6.333	
	2	.275	.136	1.469	
	3	.268	.146	.606	
	4	.272	.135	.546	
	5	.27	.133	.528	
Louez	3	.291	.213	4.702	
Ablainzevelle	5	.245	.172	.575	
	6	.287	.132	.661	
Frevent	8	.265	.088	1.069	
Les Attaques	10	.226	.148	13.177	
Ablainzevelle	11	.236	.096	.527	
Oisy-le-Verger	13	.337	.094	1.367	
Lumbres	14	.292	.108	2.378	
	15	.212	.157	5.747	
Lagnicourt	16	.343	.119	1.328	
Bethune	17	.303	.144	1.59	
Bapaume	19	.283	.105	.625	
Campagne-les-Hesdin	21	.222	.103	.985	
Fouquières	23	.231	.072	5.201	
Bapaume	25	.223	.122	.775	
Oignies	26	.206	.063	.586	
Auchy-lez-La-Bassée	28	.238	.133	2.201	
Oignies Les Chats-Huants	1	.18	.053	.455	
Ecoust-Saint-Mein	1	.258	.182	2.172	
	2	.284	.124	.827	
	3	.256	.128	.586	
Bethune	1	.209	.09	1.379	
	2	.224	.092	1.031	

BOUCHES-DU-RHÔNE.[a]

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
La Crau	1	0.241	0.099	0.35	0.482
	2	.221	.088	.708	.382
	3	.204	.088	1.64	.498
	4	.177	.103	.464	.616
	5	.416	.128	1.588	.56
	6	.339	.091	.384	.56
	7	.491	.053	.972	.612
	8	.341	.197	12.00	.854
Limon de Durance		.26	.102	23.75	.833
		.252	.108	20.905	.989
		.353	.109	23.12	1.15
		.312	.104	20.777	.94
Limon du Rhône		.396	.118	23.05	.358
Sables du Rhône	1	.213	.112	31.50	.666
	2	.20	.101	32.40	.53
	3	.082	.094	16.83	.32
	4	.07	.078	18.30	.56
	5	.062	.069	19.30	.52
	6	.094	.104	19.80	.587

[a] Gastine. Ann. Sci. Agron., 1898, pp. 155, 240. Bul. Min. Agr. France, 1897, pp. 614–655.

Chemical composition of the soils of France—Continued.

BOUCHES-DU-RHÔNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime $CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Sables du Rhône	7	0.091	0.094	20.20	0.586
	8	.062	.069	24.50	.421
	9	.093	.078	22.50	.629
	10	.059	.101	23.60	.48
	11	.06	.077	21.41	.547
	12	.06	.093	27.65	.53
	13	.111	.135	18.40	.404
	14	.085	.15	34.45	.157
	15	.065	.129	22.10	.437
	16	.076	.124	22.15	.53
	17	.111	.15	21.45	.52
	18	.163	.148	22.10	.648
	19	.066	.078	17.30	.530
	20	.073	.096	17.56	.578
	21	.399	.13	30.30	1.657
	22	.198	.14	24.40	.684
	23	.129	.122	19.00	.731
	24	.21	.138	21.70	.462
	25	.078	.106	20.40	.547
	26	.085	.13	18.76	.478
	27	.085	.126	22.28	.58
	28	.074	.111	20.00	.334
	29	.316	.165	25.25	.892
	30	.181	.128	20.30	.606
	31	.153	.134	20.25	.597
	32	.222	.18	22.44	.714
	33	.236	.137	26.40	.86
	34	.075	.076	18.24	.612
La Camargue	1	.224	.159	31.87	1.136
	2	.212	.16	33.59	.944
	3	.419	.169	32.60	1.048
	4	.76	.155	34.50	1.387
	5	.545	.145	33:87	1.106
	6	.29	.145	33.97	1.162
	7	.418	.153	31.85	1.228
	8	.224	.139	32.40	1.518
	9	.183	.14	24.20	.875
	10	.217	.16	25.21	.94
	11	.249	.147	32.75	1.080
	12	.298	.15	32.22	1.039
	13	.412	.133	35.85	1.51
	14	.308	.14	29.80	1.107
	15	.268	.145	33.75	1.104
	16	.255	.14	32.50	.255
	17	.21	.125	31.92	1.201
	18	.278	.135	32.14	1.065
	19	.429	.16	30.95	1.013
	20	.152	.153	25.60	.992
	21	.374	.099	34.86	1.046
	22	.472	.108	32.90	1.096
	23	.547	.125	38.62	.974
	24	.437	.143	33.70	1.104
	25	.49	.138	34.70	1.042
	26	.525	.144	36.40	1.065

MARNE.[a]

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime $CaCO_3$).	Magnesium (MgO).
Verzy: Verzenay	21	0.171	0.205	14.50	0.007
	12	.186	.134	19.00	.036
	24	.237	.215	17.50	.011
	30	.115	.169	14.10	.009
Verzy	29	.205	.18	8.20	.003
	65	.136	.186	18.30	.007
	45	.19	.216	10.20	.043
	13	.169	.133	8.00	.034
	S	.135	.095	1.74	.091
Villers-Marmery	34	.241	.186	9.30	.092
	22	.219	.17	12.50	.101
	21	.278	.195	14.00	.106
	6	.252	.142	2.30	.086
	37	.258	.242	25.20	.139
	31	.18	.264	26.80	.097
	35	.168	.200	19.60	.048

[a] Müntz. Bul. Min. Agr., France, 1893, 170–210.

Chemical composition of the soils of France—Continued.

MARNE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime $CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Ville-en-Tardenois: Pargny	....	0.186	0.153	32.10	0.164
		.168	.123	27.80	.137
		.246	.111	14.50	.288
		.246	.058	36.00	.288
		.23	.089	16.50	.205
		.144	.061	4.00	.108
Villedomange	....	.263	.165	9.30	.262
		.281	.13	13.30	.249
Courmas	1	.534	.094	30.50	.146
	2	.622	.08	22.50	1.124
Bouzy	....	.139	.161	11.35	.295
		.257	.14	8.85	.016

CHARENTE-INFERIEURE.[a]

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime $CaCO_3$).	Magnesium (MgO).
Perigny	1	0.434	0.089	....	....
	2	.482	.142	....	....
Chevillon	3	.778	.146	....	....
	4	.379	.124	....	....
	5	.742	.147	....	....

LOIRE-INFERIEURE.[b]

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime $CaCO_3$).	Magnesium (MgO).
Nozay	1	0.07	0.08	0.07	0.07
	2	.05	.04	.05	.10
	3	.04	.04	.05	.04
	4	.10	.05	.13	.20
	5	.02	.07	.02	.02
	6	.05	.06	.09	.05
	7	.07	.03	.02	.08
	8	.13	.16	.09	.17
	9	.02	.17	.04	.02
	10	.07	.02	.09	.11
	11	.03	.09	.03	.05
	12	.11	.07	.11	.12
	13	.03	.05	.03	.03
	14	.05	.05	.03	.03
	15	.06	.15	.07	.03
	16	.10	.14	.12	.08
	17	.08	.12	.09	.14
	18	.08	.13	.07	.10
	19	.09	.15	.10	.16
	20	.12	.14	.12	.26
	21	.04	.08	.04	.04
	22	.11	.14	.09	.16
	23	.05	.10	.11	.06
	24	.04	.13	.11	.06
	25	.05	.13	.08	.06
	26	.06	.15	.04	.06
	27	.04	.11	.05	.01
	28	.11	.12	.07	.06
	29	.11	13	.04	.09
	30	.06	.09	.06	.05
	31	.04	.05	.04	.02
	32	.07	.08	.06	.05
	33	.06	.08	.09	.06
	34	.13	.11	.13	.05
	35	.08	.01	.07	.02
	36	.07	.03	.02	.01
	37	.05	.03	.02	.01
	38	.03	.04	.04	.03
	39	.05	.04	.06	.08
	40	.06	.10	.17	.11
	41	.04	.03	.05	.05
	42	.06	.03	.05	.06
	43	.04	.08	.03	.02
	44	.07	.05	.11	.04
	45	.05	.05	.07	.05
	46	.10	.06	.07	.06
	47	.18	.07	.04	.03
	48	.09	.13	.08	.08
	49	.06	.12	.05	.05
	50	.13	.14	.08	.04

[a] Verneuil. Prog. Agr. Viticole, 21, 491 (1894). [b] Bul. Sta. de la Loire-Inférieure, 1900–01, 1903–4.

Chemical composition of the soils of France—Continued.

LOIRE-INFERIEURE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Nozay	51	0.12	0.12	0.11	0.10
	52	.10	.13	.11	.06
	53	.11	.10	.13	.05
	54	.15	.11	.12	.07
	55	.13	.10	.11	.05
	56	.11	.11	.11	.13
	57	.09	.09	.11	.06
	58	.12	.09	.07	.08
	59	.09	.10	.10	.09
	60	.11	.10	.10	.10
	61	.16	.13	.18	.07
	62	.09	.10	.10	.11
	63	.10	.12	.15	.14
	64	.09	.11	.08	.10
	65	.09	.05	.11	.23
	66	.03	.04	.04	.19
	67	.03	.05	.06	.21
	68	.04	.05	.06	.19
	69	.08	.11	.12	.39
	70	.13	.11	.15	.43
	71	.08	.08	.09	.25
	72	.07	.07	.06	.19
	73	.08	.06	.14	.25
	74	.14	.06	.07	.19
	75	.07	.06	.07	.15
	76	.09	.03	.11	.07
	77	.03	.02	.04	.04
	78	.05	.02	.06	.07
	79	.02	.02	.04	.04
	80	.04	.01	.05	.08
	81	.02	.01	.02	.05
	82	.06	.01	.06	.09
	83	.09	.05	.07	.05
	84	.03	.02	.03	.02
	85	.07	.08	.12	.04
	86	.11	.10	.13	.07
	87	.09	.06	.09	.04
	88	.12	.10	.15	.10
	89	.05	.05	.08	.04
	90	.05	.07	.08	.08
	91	.07	.02	.04	.05
	92	.04	.03	.04	.01
	93	.09	.08	.14	.11
	94	.06	.05	.08	.16
	95	.09	.05	.10	.05
	96	.13	.06	.14	.08
	97	.12	.08	.19	.11
	98	.11	Trace.	.02	.05
	99	.10	.05	.14	.07
	100	.14	.08	.09	.08
	101	.13	.06	.19	.10
	102	.12	.02	.14	.10
	103	.15	.08	.22	.16
	104	.12	.05	.19	.12
	105	.08	.09	.20	.14
	106	.06	.09	.10	.05
	107	.19	.10	.15	.12
	108	.07	.07	.11	.06
	109	.08	.11	.15	.10
	110	.13	.12	.16	.18
	111	.09	.12	.13	.12
	112	.04	.12	.31	.02
	113	.08	.10	.24	.07
	114	.09	.11	.15	.10
	115	.08	.09	.20	.11
	116	.10	.11	.20	.10
	117	.13	.13	.17	.12
	118	.06	.07	.19	.12
	119	.10	.13	.10	.12
	120	.15	.14	.14	.23
	121	.07	.09	.08	.04
	122	.03	.04	.04	.06
	123	.08	.12	.31	.11
	124	.05	.11	.23	.06
	125	.05	.15	.23	.08
	126	.07	.12	.13	.08
	127	.11	.10	.13	.15
	128	.12	.10	.10	.13
	129	.13	.14	.09	.08

Chemical composition of the soils of France—Continued.

LOIRE-INFERIEURE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Nozay	130	0.08	0.06	0.13	0.05
	131	.10	.14	.09	.06
	132	.20	.07	.15	.22
	133	.13	.05	.09	.12
	134	.06	.04	.05	.05
	135	.08	.07	.15	.06
	136	.06	.07	.07	.04
	137	.07	.08	.12	.07
	138	.09	.07	.12	.08
	139	.03	.03	.05	.02
	140	.02	.03	.04	.02
	141	.14	.09	.32	.12
	142	.07	.07	.09	.06
	143	.07	.11	.11	.06
	144	.05	.18	.62	.13
	145	.06	.09	.15	.06
	146	.09	.04	.05	.05
	147	.12	.08	.18	.07
	148	.09	.04	.10	.21
	149	.08	.08	.13	.21
	150	.10	.04	.11	.13
	151	.10	.07	.09	.14
	152	.10	.07	.09	.11
	153	.08	.06	.06	.16
	154	.13	.03	.10	.16
	155	.13	.07	.18	.26
	156	.11	.05	12	.15
	157	.06	.02	.04	.07
	158	.07	.05	.05	.10
	159	.07	.03	.08	.06
	160	.03	.02	.06	.07
	161	.12	.05	.08	.14
	162	.07	.09	.05	.09
	163	.09	.05	.05	.11
	164	.06	.02	.06	.05
	165	.08	.03	.08	.31
	166	.13	.04	.09	.28
	167	.04	.03	.05	.06
	168	.05	.07	.08	.07
	169	.04	.04	.08	.04
	170	.21	.06	.14	.37
	171	.10	.07	.11	.20
	172	.13	.09	.20	.33
St. Viaud: Plessis-Grimaud (appx. 250 hectares)	....	.07	.03	.16	.13
	....	.21	.09	.17	.15
	....	.17	.04	.29	.27
	....	.14	.04	.26	.16
	....	.12	.06	.16	.12
	....	.23	.08	.13	.21
	....	.21	.06	.10	.26
	....	.09	.06	.15	.06
	....	.17	.04	.16	.19
	....	.20	.09	.13	.14
	....	.24	.03	.35	.60
	....	.12	.06	.32	.23
	....	.14	.06	.18	.12
	....	.22	.08	.18	.31
	....	.19	.07	.12	.30
	....	.16	.07	.16	.24
	....	.21	.06	.18	.56
	....	.17	.05	.47	.37
	....	.10	.09	.16	.44
	....	.14	.05	.30	.23
	....	.14	.04	.24	.20
	....	.15	.06	.08	.14
	....	.21	.05	.30	.17
	....	.15	.06	.15	.31
	....	.10	.05	.18	.24
	....	.16	.06	.27	.33
	....	.12	.04	.14	.18
	....	.18	.06	.11	.26
	....	.15	.08	.22	.15
	....	.10	.07	.39	.23
	....	.17	.08	.18	.25
	....	.15	.09	.33	.34
	....	.12	.04	.12	.38
	....	.11	.06	.12	.40
	....	.20	.06	.10	.12
	....	.09	.04	.07	.03

Chemical composition of the soils of France—Continued.

LOIRE-INFERIEURE—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
St. Viaud: Plessis-Grimaud	....	0.10	0.10	0.06	0.04
	....	.18	.06	.08	.07
	....	.20	.06	.20	.09
	....	.18	.08	.12	.51
	....	.12	.04	.11	.72
	....	.15	.07	.21	.76
	....	.10	.06	.15	.54
	....	.11	.05	.12	.45
	....	.15	.06	.27	.39
	....	.20	.06	.12	.20
	....	.14	.08	.22	.17
	....	.12	.04	.06	.27
	....	.25	.08	.09	.20
	....	.12	.04	.05	.04
	....	.18	.07	.21	.36
	....	.20	.08	.10	.25
	....	.22	.06	.16	.34
	....	.12	.07	.09	.21
	....	.20	.06	.10	.12
	....	.22	.09	.18	.37
	....	.25	.06	.15	.31
	....	.25	.03	.17	.51
	....	.24	.07	.12	.11
	....	.22	.05	.09	.05
	....	.23	.07	.07	.09
	....	.21	.05	.09	.20
	....	.22	.07	.27	.10
	....	.15	.06	.10	.12
	....	.12	.05	.20	.15
	....	.13	.06	.19	.17
	....	.10	.04	.47	.13
	....	.14	.05	.13	.10
	....	.18	.06	.11	.09
	....	.17	.05	.38	.53
	....	.51	.04	.17	.12
	....	.16	.04	.18	.10
	....	.15	.04	.16	.09

HÉRAULT.[a]

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
Capestang: Alluvions de Capestang	1	0.131	0.095	15.164	....
	2	.114	.087	8.512	....
Murviel: Alluvions de l'Orb	3	.117	.132	2.918	....
Thézan	4	.158	.107	3.87	....
Lignan	5	.10	.07	.006	....
Sauvian	6	.172	.09	.437	....
Lignan	7	.149	.138	3.466	....
Beziers	8	.139	.146	5.60	....
	9	.131	.179	3.816	....
Villeneuve	10	.175	.134	2.635	....
	11	.182	.15	4.584	....
Lieuran: Alluvions de Libron	12	.134	.101	6.889	....
Beziers	13	.107	.071	1.38	....
Servian: Alluvions de la Tongue	14	.15	.137	6.364	....
	15	.171	.108	8.288	....
Saint-Thibery: Alluvions de l'Hérault	16	.171	.154	6.944	....
	17	.164	.155	7.224	....
Bessan	18	.195	.14	7.28	....
	19	.168	.20	7.112	....
Agde	20	.174	.167	8.344	....
	21	.20	.133	8.848	....
Agde: Sables des dunes	22	.047	.088	11.088	....
Lieuran: Diluvium de l'Epinouse	23	.167	.04	1.686	....
Servian	24	.143	.042	.003	....
Saint-Thibery	25	.192	.055	.431	....
	26	.076	.06	.781	....
	27	.147	.056	.896	....
Beziers	28	.135	.047	.706	....
Servian: Dépôts fluvio-volcaniques	29	.122	.26	3.147	....
Agde: Terrain pliocène	30	.258	.114	1.419	....
	31	.121	.082	17.64	....
Servian	32	.164	.081	3.214	....
Autignec: Terrain miocène	33	.102	.15	12.712	....
Murviel	34	.127	.095	6.72	....
Pomerols	35	.20	.119	10.92	....

[a] Lagatu and Semichon. Matériaux pour une Étude des Terres du Département de l'Hérault, 1893; Prog. Agr. et Vitu., 19, 105, 162, 179, 233, 276, 447, 489 (1893).

Chemical composition of the soils of France—Continued.

HÉRAULT—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime ($CaCO_3$).	Magnesium (MgO).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Murviel	36	0.103	0.121	15.904	
Beziers	37	.044	.052	15.848	
Maureilham	38	.098	.157	15.344	
Capestang	39	.134	.162	11.76	
Pinet	40	.188	.054	17.304	
Beziers	41	.105	.177	24.136	
	42	.266	.136	28.836	
Pinet	43	.212	.038	30.408	
Beziers	44	.131	.092	14.84	
	45	.236	.139	23.016	

DORDOGNE.[a]

Terrains granitiques		0.255	0.034	0.012	
		.244	.0492	.0556	
		.235	.046	.0491	
				$CaCO_3$	
Terrains crétacés		.08	.0796	16.00	
		.069	.095	64.00	
Sables du Périgord		.0812	.0256	Trace.	
Saint-Nexans: Bouvées argilo-siliceuses		.1445	.0256	Trace.	
Lunas: Bouvées silico-argileuses		.091	.022	Trace.	
Lèves		.209	.069	2.24	
Saint-Alvère		.075	.079	16.00	
Landais: Terrains tertiaires		.097	.02	.119	
		.195	.051	2.77	
		.258	.056	2.24	
		.319	.059	1.39	
Terrains quaternaires		.15	.0703	.2225	0.125
		.189	.0615	.184	

MEURTHE-ET-MOSELLE.[b]

Cirey: Grès bigarrés		0.1717	0.0523	0.0364	0.075
Bertrichamp: Grès bigarrés		.0901	.0212	.028	.10
Marnes		.1819	.0559	.0532	.05
Argile		.1972	.0634	.1512	.08

HAUTE-PYRÉNÉES.[c]

Vallée de Luz	1	0.455	0.123	0.0107	
Prairie irriguée	2	.098	.202	.0171	
Prairie tourbeuse	3	.097	.394	.082	
Prairie sèche	4	.287	.128	.0137	

EURE-ET-LOIR.[d]

	206	0.096	0.069	0.84	0.148
	210	.081	.039	.39	.10
	212	.096	.051	.49	.092
	214	.105	.045	.91	.096
	216	.084	.056	1.09	.079
	220	.086	.036	.84	.086
	222	.076	.034	.53	.073
	224	.098	.061	5.60	.084
	226	.072	.06	.47	.075
	228	.079	.047	.42	.078
	230	.086	.051	.58	.086

ÉPERNAY.[d]

Aoise: Mesnil-sur-Oger	1	0.178	0.186	28.95	0.025
	2	.169	.157	41.65	.093

[a] Ann. Inst. Nat. Agron. France, 14, 61 (1891-92).
[b] Bourgeois. Chaire departmentale d'agriculture. Rapports, 1891.
[c] Faure. Ann. Inst. Nat. Agron., 13, 117 (1888-91).
[d] Commission météorologique d'Eure-et-Loir, Rapports sur les champs d'experiences, 1891-1892.

There have been 1,550 samples reported upon from France with the extreme range for potash 0.02 to 1.30 per cent, phosphoric acid 0.01 to 7.14 per cent, lime 0.003 to 94.70 per cent, and magnesia 0.001 to 1.657 per cent.

Chemical composition of the soils of Germany.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
HESSE.[a]		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Buntsandstein	......	0.25	0.17	0.35	0.31
		.32	.13	.39	.38
		.31	.12	.37	.30
Basalt	....	.11	.15	.89	1.16
Grauwacke	....	.23	.18	.30	1.15
Muschelkalk	....	.14	.09	.52	1.75
"Taunusgesteine"	243	.15	.07	.10	.06
Devonien	411	.21	.02	.13	.08
"Rotliegendes"	67	.57	.12	3.16	1.13
Tertiary	6	.37	.10	14.97	1.76
	15	.37	.11	12.41	1.42
	1	.45	.05	20.20	.83
	5	.29	....	28.80	2.16
	3	.31	.12	5.55	.78
	19	.22	.30	13.60	.19
Diluvium	25	.38	.06	.38	.06
	58	....	.06	3.24	.08
	7	.19	.09	15.95	1.50
	8	.26	.26	6.85	1.05
	16	.22	.15	6.46	.45
	16	.11	.25	17.68	2.07
Alluvium	10	.35	....	2.12	.63
	21	.23	.14	3.41	.42
	20	.29	.25	4.73	.83
	12	.21	....	9.00	.37
PRUSSIA.[b]					
Köslin:[c]					
Koppenow	....	.094	.0709	.109	....
Zdrewen	....	.133	.0853	.2505	....
Dubberzin	....	.0936	.0603	.2243	....
Gross-Silber	....	.0572	.0657	.1991	....
		.0577	.0488	.1336	....
Reinwasser	....	.0524	.0881	.1292	....
Kl.-Spiegel	....	.069	.118	.05	....
		.076	.075	.067	....
Garden	....	.068	.037	.134	....
Neuhaus	....	.06	.044	.109	....
Helenenau	....	.065	.065	.095	....
Gr.-Raddow	....	.044	.06	.082	....
Landechow	....	.083	.089	.156	....
Schinz	....	.038	.053	.035	....
Breitenberg	....	.058	.099	.185	....
Schmolsin	....	.03	.079	.072	....
Gr.-Mellen	....	.026	.092	.048	....
Knick	....	.03	.072	.15	....
WEST PRUSSIA.[d]					
Kainozoic	....	.081	.105	.182	.422
		.065	.096	.147	.199
		.068	.094	.153	.175
		.052	.094	.14	.154
		.049	.098	.14	.137
		.027	.09	.233	.163
		.039	.053	.171	.059
		.078	.133	5.783	.261
		.037	.069	.087	.044
		.078	.106	.898	.333
		.061	.065	.70	.103
		.061	.042	.847	.43
		.092	.054	.20	.028
Mesozoic	....	.039	.018	.683	.042
		.066	.053	.343	.103
		.103	.03	2.507	.533

[a] Habernoll, Mitt. Landw. Inst. könig... Univ. Breslau, 2, 147 (1899). Haselhoff, Fühlings landw. Ztg., 55, 73 (1906).
[b] Baessler, Ber. Thät. Agrik.-Chem. Versuchs-und Samencontrolstation, Köslin, 1897, 1899.
[c] The potash analyses were made with 10 per cent hydrochloric acid. The phosphoric acid and lime results are based upon complete analyses.
[d] Wohltmann, Das Nahrestoff-Kapital west-deutscher Böden, Bonn, 1901. Analyses with cold hydrochloric acid.

Chemical composition of the soils of Germany—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
WEST PRUSSIA [a]—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Mesozoic		0.113	0.025	22.067	0.113
		.031	.06	3.24	.202
		.039	.021	.183	.144
		.056	.045	.347	.084
		.039	.047	.127	.096
		.05	.083	.027	.017
		.077	.115	.28	.065
		.047	.169	.386	.048
Paleozoic	....	.135	.058	4.403	.216
		.144	.171	2.60	.37
		.026	.034	.087	.019
		.188	.235	.297	.659
		.123	.192	1.63	.144
		.04	.028	Trace.	.019
		.129	.092	.293	.072
Eruptive rocks	....	.179	.041	.753	.176
		.212	.209	1.849	.574
Humus soils	3	.14	.22	1.03	....
	8	.34	.44	2.85	....
	13	.10	.13	1.40	....
	21	.05	.29	2.37	....
Heavy soils	5	.15	.35	1.91	....
	7	.48	.13	.88	....
	9	.21	.32	.77	....
	11	.17	.11	.19	....
	17	.30	.09	.86	....
	20	.17	.12	.84	....
	22	.75	.13	1.77	....
	23	.23	.11	.41	....
	27	.58	.13	.67	....
	28	.25	.10	.31	....
	29	.18	.09	.44	....
Medium soils	1	.17	.09	.38	....
	2	.11	.08	.19	....
	12	.13	.05	.40	....
	14	.17	.08	.35	....
	18	.16	.12	.27	....
	24	.16	.09	.17	....
	25	.09	.09	.16	....
	26	.19	.16	6.40	....
Light soils	4	.21	.10	.18	....
	6	.11	.23	.43	....
	10	.04	.19	.11	....
	15	.07	.08	.13	....
	16	.07	.09	.18	....
	19	.07	.09	.26	....
	30	.08	.10	.17	....
Westphalia [b] Lünten Dömern	1	.047	.016	.076	....
	9	.063	.036	.128	....
	20	.265	.028	.077	....
	4	.049	.022	.157	....
	3	.419	.061	.571	....
	2	.074	.016	.157	....
	18	.024	.016	.225	....
	11	.148	.023	.152	....
	5	.304	.015	.081	....
	13	.129	.019	.251	....
	22	.031	.019	.178	....
	24	.025	.026	.192	....
	25	.03	.011	.103	....
	26	.066	.029	.40	....
	7	.149	.04	.027	....
	8	.05	.012	.017	....
	16	.256	.01	.025	....
Wettringen, Bilk, and Haddrup:					
I (a)	0	.029	.03	.097	.063
	3	.033	.018	.192	.045
	5	.051	.003	.133	Trace.
	8	.019	.011	.007	Trace.
	9	.04	.01	.007	Trace.
	15	.019	Trace.	.079	.048
I	0	.092	.02	.036	.032
	1	.063	.009	.20	.032

[a] Schmoeger Landw. Jahrb., vol. 34, p. 160 (1905). Blanck, Landw. Vers.-Sta., 60, 407 (1904). The first two soils were treated with hot concentrated hydrochloric acid. The following five soils were treated with double-strength hydrochloric acid, and for the last two soils complete analyses are given.
[b] Haselhoff and Breme. Die Haideböden. Westfalens, 1899 to 1903.

Chemical composition of the soils of Germany—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
WEST PRUSSIA—continued					
Wettringen, Bilk, and Haddrup—Con.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
I......	4	0.04	0.021	0.01	0.029
	9	.024	.021	.029	.031
	11	.009	.003	.05	.036
	16	.014	.092	.125	Trace.
	19	.033	.029	.148	.043
	31	.019	.044	.255	.025
II......	1	.019	Trace.	.075	.039
	2	.01	.070	.126	.071
	5	.033	.022	.097	.016
	6	.032	.01	.203	.00
	12	.069	.00	.00	.00
	16	.023	.016	.056	.00
	21	.023	.016	.089	.00
	25	.051	Trace.	.032	.01
III......	1	.049	.014	.143	.003
	2	.025	.008	.00	.018
	5	.057	Trace.	.072	.035
	10	.04	.005	Trace.	.033
	13	.018	.006	.18	Trace.
IV......	1	.019	.00	.01	.00
	5	.024	.014	.003	.024
	10	.05	.007	.138	.004
V......	1	.013	.066	.176	.025
	3	.014	.017	.182	.014
	5	.066	.066	.058	.20
	8	.014	.00	.139	.031
VI......	1	.028	.03	.014	.008
	2	.024	.018	.028	.014
	6	.016	.023	.286	.083
VII......	2	.016	.015	.021	.021
	7	.019	.015	.261	.003
	16	.003	.012	.025	.007
	22	.027	.014	.05	Trace.
VIII......	1	.022	.11	.05	Trace.
	8	.014	.056	.075	.023
	12	.038	.031	.072	.028
	16	.027	.007	.01	.016
	20	.028	.018	.063	.002
IX......	2	.091	.066	.063	.102
	12	.05	.026	.043	.099
	14	.023	.00	.041	.081
	20	.029	.00	.051	.092
	21	.032	.00	.075	.037
	28	.036	.028	.083	.018
	32	.049	.013	.065	.017
X......	4	.027	.016	Trace.	.031
	9	.061	.014	Trace.	.014
	13	.044	.023	.155	.004
	16	.053	.013	.075	Trace.
Handorf and Telgte	13	.008	.071	.112	.018
	6	.075	.012	.023	.008
	1	.057	.019	.077	.022
	2	.088	.032	.135	.017
	3	.026	.025	.119	.005
	5	.012	.038	.00	.008
	10	.106	.028	.114	.032
	15	.127	.051	.046	.129
	20	.114	.053	.165	.131
	1	.103	.041	.023	.17
	8	.037	.043	.112	.123
	10	.05	.032	.096	.037
	18	.068	.097	.092	.08
	20	.025	.16	.16	.14
St. Mauritz, Gelmer, and Gimbte	3	.023	.039	.365	.062
	4	.129	.027	.178	....
	5	.071	.028	.042	Trace.
	7	.01	.039	.543	.045
	8	.201	.028	.337	.094
	9	.086	.036	.117	.00
	12	.157	.058	.154	.02
	12	.053	.024	.348	.00
	15	.093	.04	.138	.01
Wiedenbrück	1	.054	.021	.12	.113
		.083	.053	.348	.053
		.083	.062	.288	.079
		.073	.07	.961	.278

Chemical composition of the soils of Germany—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
WEST PRUSSIA—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Wiedenbrück—Continued	....	0.06	0.032	0.108	0.049
	2	.073	.006	.075	.021
	5	.115	.024	.14	.054
	6	.045	.011	.063	.023
		.009	.022	.048	.017
	8	.148	.011	.418	.082
		.023	.078	.183	.076
	9	.146	.10	.105	.081
		.048	.027	.194	.045
	14	.006	.009	.052	.01
		.022	.059	.088	.031
	17	.004	.016	.073	.027
		.004	.023	.116	.032
	18	.014	.032	.174	.191
	19	.025	.037	.091	.028
		.006	.031	.079	.02
	20	.051	.066	.205	.013
		.021	.034	.113	.014
		.017	.029	.08	.015
	21	.02	.029	.04	.03
		.101	.03	.165	.012
	22	.092	.013	.03	.009
		.018	.018	.21	.026
	23	.040	.029	.04	.026
		.064	.014	.061	.011
	24	.043	.027	.12	.01
		.017	.085	.048	.015
		.088	.024	.093	.054
		.157	.015	.078	.032
	25	.07	.034	.085	.016
		.021	.03	.012	.015
	26	.039	.014	.028	.011
		.014	.064	.038	.009
	27	.042	.009	.063	.022
		.123	.014	.08	.035
	28	.019	.016	.14	.02
		.033	.032	.23	.002
		.061	.022	.51	.058
	29	.041	.015	.035	.003
		.076	.006	.048	.006
	30	.085	.01	.028	....
		.04	.011	.023	....
	31	.024	.021	.073	.035
	32	.033	.041	.09	.038
	35	.052	.038	.07	.042
		.042	.023	.10	.027
		.056	.026	.178	.034
		.029	.008	.035	.019
	37	.058	.019	.08	.016
	39	.025	.022	.023	.013
	40	.051	.021	.04	.008
	42	.035	.009	.02	....
		.06	.032	.025	.022
		.016	.035	.15	.02
	43	.013	.029	.143	.021
	46	.099	.013	.043	.014
	47	.032	.018	.055	.011
	48	.047	.035	.043	Trace.
	50	.053	.019	.045	
		.062	.029	.04	.014
	51	.051	.003	.045	.009
		.126	.032	.035	.001
	52	.165	.012	.038	.005
		.041	.013	.062	.023
		.031	.009	.074	.009
		.015	.027	.123	.007
	53	.03	.066	.055	.005
		.063	Trace.	.012	Trace.
	54	.042	.005	.023	....
	56	.036	.006	.09	.007
	57	.034	.011	.11	Trace.
		.048	Trace.	.038	Trace.
	58	.008	.021	.12	Trace.
	59	.079	.006	.005	Trace.
	61	.091	.021	.013	.007
	62	.065	.008	.01	Trace

Chemical composition of the soils of Germany—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
WEST PRUSSIA—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Arendsee[a]	1	0.055	0.048	0.343	0.041
Wessnig[a]	2	.116	.158	.317	.132
Harpe[a]	3	.074	.072	.912	.048
Schurigshof[a]	4	.094	.05	.285	.074
Schwemsal[a]	5	.191	.093	.563	.342
Lauchstädt[a]	6	.446	.084	.984	.52
Vitzenburg[a]	7	.339	.148	5.75	1.666
Wessnig[a]	8	.167	.08	.503	.338
	9	.510	.814	4.019	1.257
	10	.277	.158	.81	.836
EAST PRUSSIA	....	.3336	.1180	1.059	.2026
		.3486	.1113	1.093	.1529
		.68	.09	.41	1.16
		.81	.18	.48	1.87
		.14	.13	.50	1.17
		.15	.11	.38	.79
		.34	.11	1.08	.18
		3.10	.252	1.99	1.09
		3.23	.245	1.82	1.18
OLDENBURG.[b]					
Marsh soils	1	2.23	.25	4.34	1.66
	2	2.14	.21	4.24	1.41
	3	.73	.21	5.86	1.71
	4	.89	.18	6.57	1.81
	5	.62	.23	7.09	1.85
	6	.26	.12	.43	....
	7	.17	.08	2.52	....
	8	.45	.05	.10	....
	9	.41	.13	.14	....
	10	.43	.26	.50	....
	11	.44	.15	3.28	....
	12	.39	.11	3.28	....
	13	.62	.05	.11	....
	14	.44	.18	.19	....
	15	.44	.11	.24	....
	16	.38	.16	.28	....
	17	.46	.10	....	....
	18	.33	.13	....	....
	19	.24	.10	.21	....
	20	.62	.12	.95	....
	21	.37	.11	.42	....
	22	.38	.13	.39	....
	23	.33	.09	.33	....
	24	.33	.16	1.53	....
	25	.82	.16	1.26	....
	26	.46	.11	1.16	....
	27	.57	.14	.78	....
	28	.54	.18	.39	....
	29	.32	.10	.69	....
	30	.43	.12	2.40	....
	31	.49	.12	.46	....
	32	.55	.20	.46	....
	33	.56	.19	.47	....
	34	.60	.19	.49	....
	35	1.00	.28	4.99	....
	36	.18	.08	4.48	....
	37	.39	.11	.52	....
	38	.35	.10	.46	....
Blauhandter Groden	....	.59	.151	2.27	....
Ellenserdammer Groden	....	.66	.152	3.87	....
Friedrich August Groden	....	.68	.193	4.88	....
Adelheids Groden	....	.62	.235	5.16	....
Peters Groden	....	.56	.25	5.28	....
BAVARIA AND WURTTEMBERG.[c]					
Moor soils	608	.091	.276	4.82	....
	597	.077	.272	3.51	....
	610	.099	.256	2.77	....
	609	.088	.34	2.13	....
	612	.046	.183	1.50	....

[a] Schneidewind. Meyer, and Frese, Landw. Jahrb., 35, 927 (1906). Analyses made with 10 per cent hydrochloric acid, except in the case of phosphoric acid, where complete analyses are given.
[b] Schucht. Jour. Landw., 53, p. 322 (1905). Maercker, Zusammensetzung und Düngerbedürfnis Oldenburg Marscherden und deren Bewirtschaftung. Berlin, 1896.
[c] Vierteljahresschr. bayer. Landw.-Rat, 10, Ber. Arbeiten Moorkult, 1904.

Chemical composition of the soils of Germany—Continued.

Description and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
BAVARIA AND WURTEMBURG—continued.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Moor soils	611	0.056	0.266	1.20	....
	613	.060	.243	.921	....
	232	....	.185	2.85	....
	233	.237	.211	1.19	....
	234	.1265	.397	1.25	....
	235	.067	.165	.471	....
	69	.0754	....	....	....
	248	.0761	.139	.529	....
	223	.0611	.119	.387	....
	219	.0669	.146	.681	....
	243	.0738	.147	.506	....
	246	.0665	.122	.338	....
	224	.0565	.156	.454	....
	451	.0517	.127	.459	....
	242	.0638	.133	.557	....
	241	.0588	.121	.331	....
	249	.0478	.085	.61	....
	452	.0645	.142	.341	....
	453	.0682	.127	.254	....
	222	.0496	.117	.397	....
	454	....	.107	.325	....
	247	.0467	.129	.421	....
	244	.0508	.094	.377	....
	220	....	.069	.168	....
	221	....	.094	.535	....
	237	.0365	.076	.368	....
	245	.0386	.106	.214	....
	239	.032	.093	.371	....
	240	.0307	.085	.516	....
	236	.028	.066	.344	....
	238	.0238	.061	.333	....
	580	.116	.097	.36	....
	581	.097	.098	.404	....
	593	.075	.125	.28	....
	594	.074	.151	.257	....
	592	.065	.106	.439	....
	585	.076	.152	.272	....
	589	.0586	.121	.217	....
	591	.0457	.135	.306	....
	595	.064	.114	.228	....
	577	.063	.18	.24	....
	586	.074	.153	.356	....
	578	.078	.164	.29	....
	583	.056	.108	.289	....
	575	.050	.194	.32	....
	572	.061	.146	.312	....
	579	.047	.162	.336	....
	587	.0451	.117	.259	....
	576	.041	.129	.298	....
	574	.046	.127	.367	....
	588	.043	.113	.265	....
	584	.042	.088	.318	....
	590	.037	.092	.517	....
	582	.033	.096	.313	....
	573	.021	.121	.401	....
	544	.0794	.184	.383	....
	542	.0587	.152	.39	....
	1076	.0668	.259	.535	....
	547	.0673	.206	.826	....
	540	.0629	.156	.89	....
	541	.0535	.119	.425	....
	536	....	.164	.419	....
	1074	.058	.217	.423	....
	1071	.063	.182	.58	....
	539	.0482	.158	1.02	....
	537	....	.106	.40	....
	538	.0473	.083	.615	....
	543	.039	.139	.825	....
	546	.0293	.074	2.73	....
	1073	.042	.20	.576	....
	1075	.054	.207	.078	....
	1072	.041	.177	.906	....
	545	....	.094	.742	....
Loess soils [a]	1	.15	.16	14.95	0.96
	2	.12	.13	14.10	1.20
	3	.13	.13	12.50	1.20
	4	.14	.18	16.76	Trace.
	5	.12	.09	10.26	.61

[a] Halenke, Kling and Engels, Vierteljahressch. bayer. Landw.-Rat. 10, 447 (1905).

Chemical composition of the soils of Germany—Continued.

Descriptioh and locality.	Original sample No.	Potash (K_2O).	Phosphoric acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
BAVARIA AND WURTEMBURG—continued.					
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Loess soils	6	0.18	0.14	12.20	Trace.
	7	.13	.11	16.40	0.29
	8	.20	.15	17.80	.93
	9	.....	.....	47.00	.46
Middle-sandstone soils[a]	1	.06	.05	.09	.05
	2	.05	.04	.05	.04
	3	.06	.07	.17	.19
	4	.06	.09	.19	.14
	5	.03	.02	.02	.02
	6	.09	.09	.00	.27
	7	.19	.05	.014	.08
	8	.17	.18	.25	.09
	9	.13	.34	.52	.15
North German plain loess[b]	.....	2.33	.....	6.6	1.37
		2.47	.....	.59	.25
		.81	.....	.50	.17
		2.58	.....	.80	.72
		2.57	.....	.43	.70
Highland	.....	.109	.115	.064	.238
		.41	.068	.29	.64
		.026	.08	.072	.075
		.102	.03	.242	.161

[a] Blanck, Landw. Vers.-Sta., 65, 161 (1906).
[b] Burguy, Über die Bödenverhaltnisse des norddeutschen Flachlandes in ihrer Beziehung zum geologischen Aufbau desselben. Inaug.-Diss. Berlin, 1899.

There have been 449 samples reported upon from Germany with the extreme range for potash 0.003 to 3.23 per cent, phosphoric acid 0.003 to 0.814 per cent, lime 0.003 to 47.0 per cent, and magnesia 0.001 to 2.16 per cent.

CONCLUSIONS.

A careful study of the data which have been presented appears to justify two conclusions.

First. That the productivity of the newer agricultural soils of the United States and of the older agricultural soils of Europe, taken as a whole and for a nation, are not declining, as is popularly supposed. Individual farms deteriorate and soils wear out as they have always done, but as a whole it seems probable that we are producing more crops per acre than formerly. This is undoubtedly due to many factors; to better and more intelligent cultivation, more and better systems of rotation of crops, and, in later years, to intelligent use of fertilizers—three methods of control in the hands of every individual farmer. In addition, we must recognize the increase in farm animals and stock, the improvement in seed by selection and breeding, and the increasing density in population, which is forcing attention to more intensive methods.

Second. That so far as our information goes there is apparently no significant difference at the present time between the composition of the older agricultural soils of Europe and the newer agricultural soils of the United States with respect to potash, phosphoric acid, lime, and magnesia.

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